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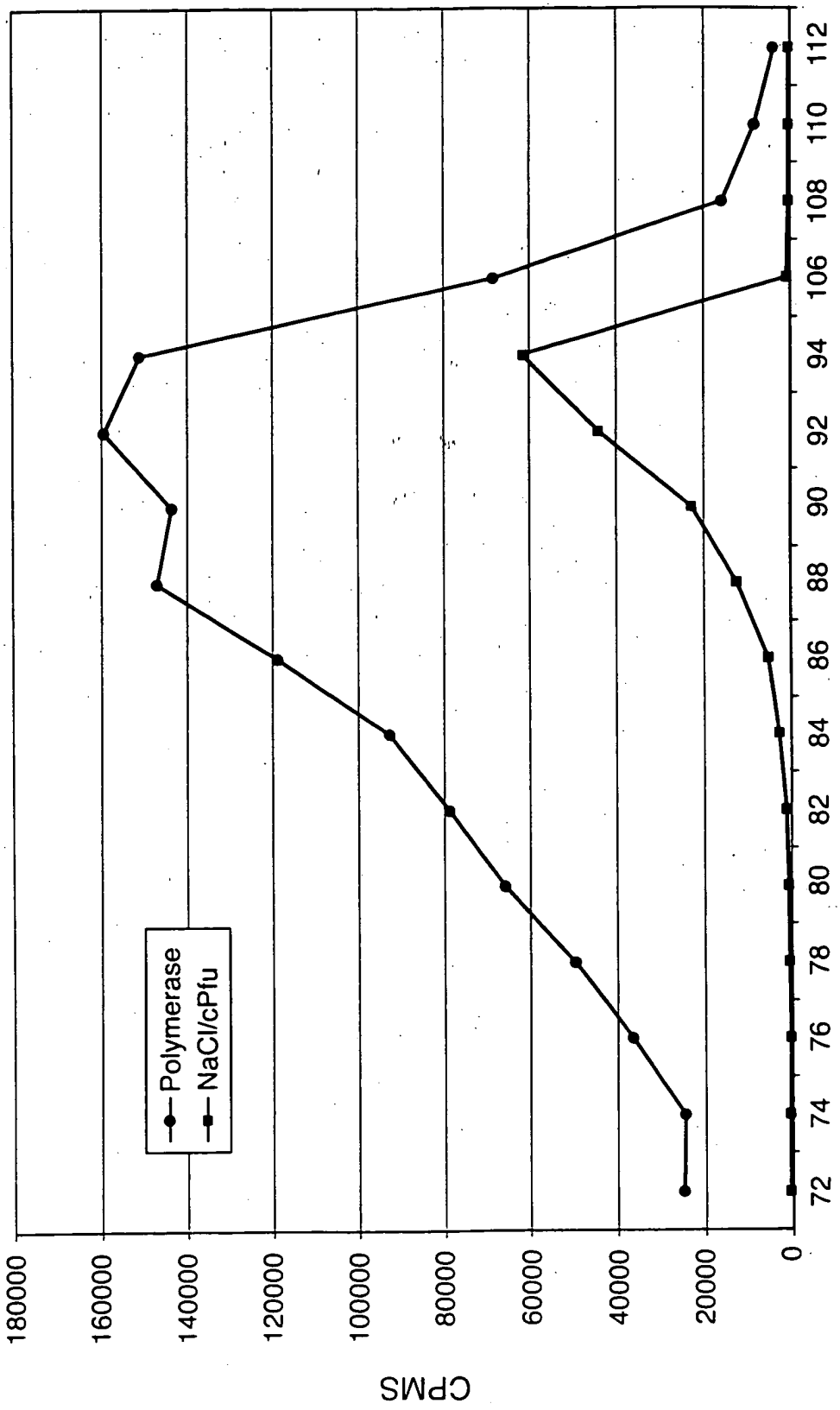

CPMS
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
FRACTION NUMBER
72
74
76
78
80
82
84
86
88
90
92
94
106
108
110
112
Polymerase
NaCl/cPfu

FIG. 1

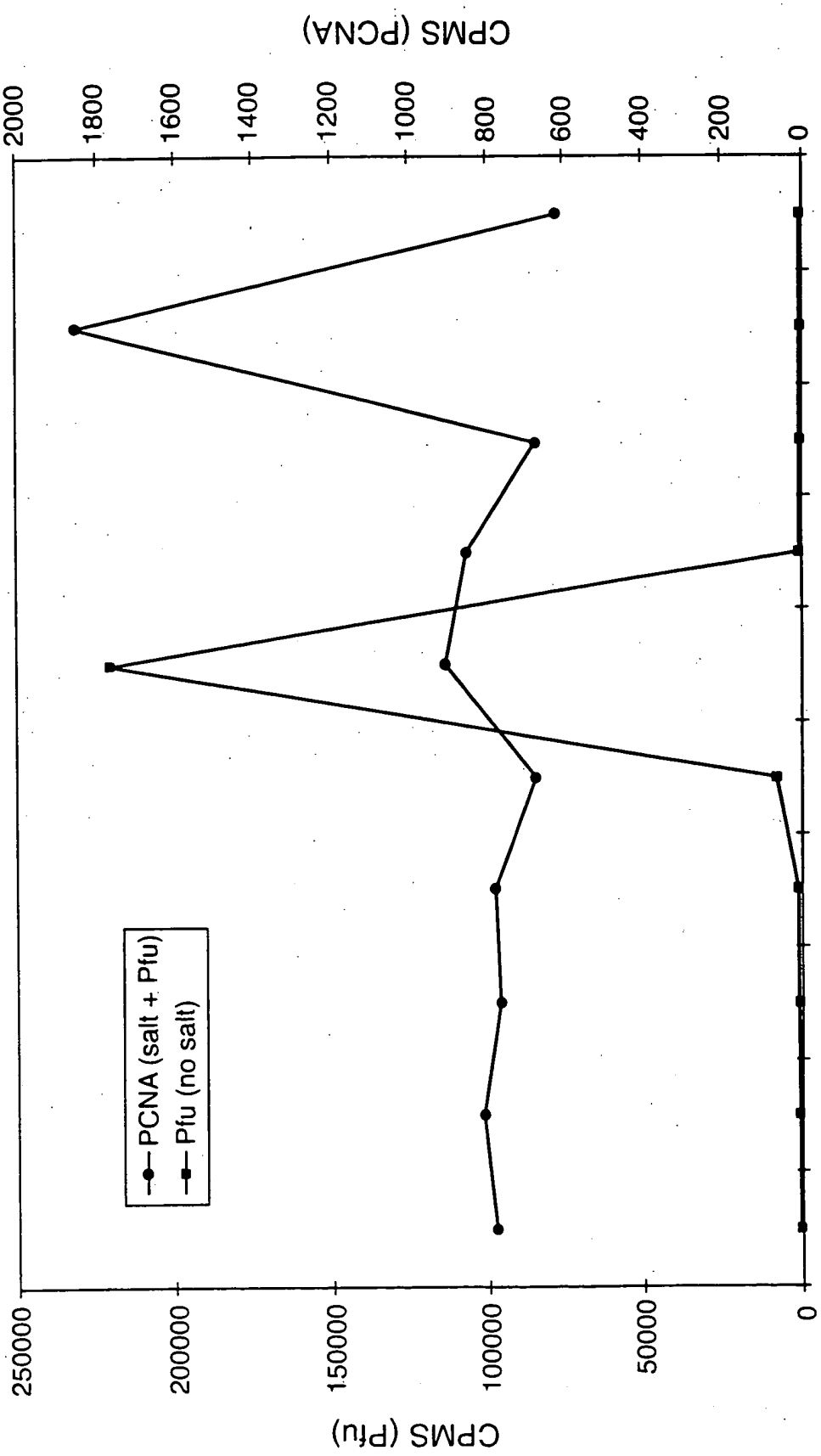

CPMS (PCNA)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
CPMS (Pfu)
250000
200000
150000
100000
50000
0
PCNA (salt + Pfu)
Pfu (no salt)
A>>250
B>250
C<250
D<250,>98
E>98
F64-98
G50-64
H36-50
J30-36
K16-30
PROTEIN MOLECULAR WEIGHT OF GEL SLICE

FIG. 2

FIG. 3

ATGCCATTCGAAATAGTCTTTGAAGGTGCAAAAGAGTTTGCCCAACTTAT
AGACACCGCAAGTAAGTTAATAGATGAGGCCGCGTTTAAAGTTACAGAAG
ATGGGATAAGCATGAGGGCCATGGATCCAAGTAGAGTTGTCCTGATTGAC
CTAAATCTCCCGTCAAGCATATTTAGCAAATATGAAGTTGTTGAACCAGA
AACAATTGGAGTTAACATGGACCACCTAAAGAAGATCCTAAAGAGAGGTA
AAGCAAAGGACACCTTAATACTCAAGAAAGGAGAGGAAAACTTCTTAGAG
ATAACAATTCAAGGAACTGCAACAAGAACATTTAGAGTTCCCCTAATAGA
TGTAGAAGAGATGGAAGTTGACCTCCCAGAACTTCCATTCACTGCAAAGG
TTGTAGTTCTTGGAGAAGTCCTAAAAGATGCTGTTAAAGATGCCTCTCTA
GTGAGTGACAGCATAAAATTTATTGCCAGGGAAAATGAATTTATAATGAA
GGCAGAGGGAGAAACCCAGGAAGTTGAGATAAAGCTAACTCTTGAAGATG
AGGGATTATTGGACATCGAGGTTCAAGAGGAGACAAAGAGCGCATATGGA
GTCAGCTATCTCTCCGACATGGTTAAAGGACTTGGAAAGGCCGATGAAGT
TACAATAAAGTTTGGAAATGAAATGCCCATGCAAATGGAGTATTACATTA
GAGATGAAGGAAGACTTACATTCCTACTAGCCCCCAGGGTCGAGGAGTGA

FIG. 4

MPFEIVFEGAKEFAQLIDTASKLIDEAAFKVTEDGISMRAMDPSRVVLID
LNLPSSIFSKYEVVEPETIGVNMDHLKKILKRGKAKDTLILKKGEENFLE
ITIQGTATRTFRVPLIDVEEMEVDLPELPFTAKVVVLGEVLKDAVKDASL
VSDSIKFIARENEFIMKAEGETQEVEIKLTLEDEGLLDIEVQEETKSAYG
VSYLSDMVKGLGKADEVTIKFGNEMPMQMEYYIRDEGRLTFLLAPRVEE*

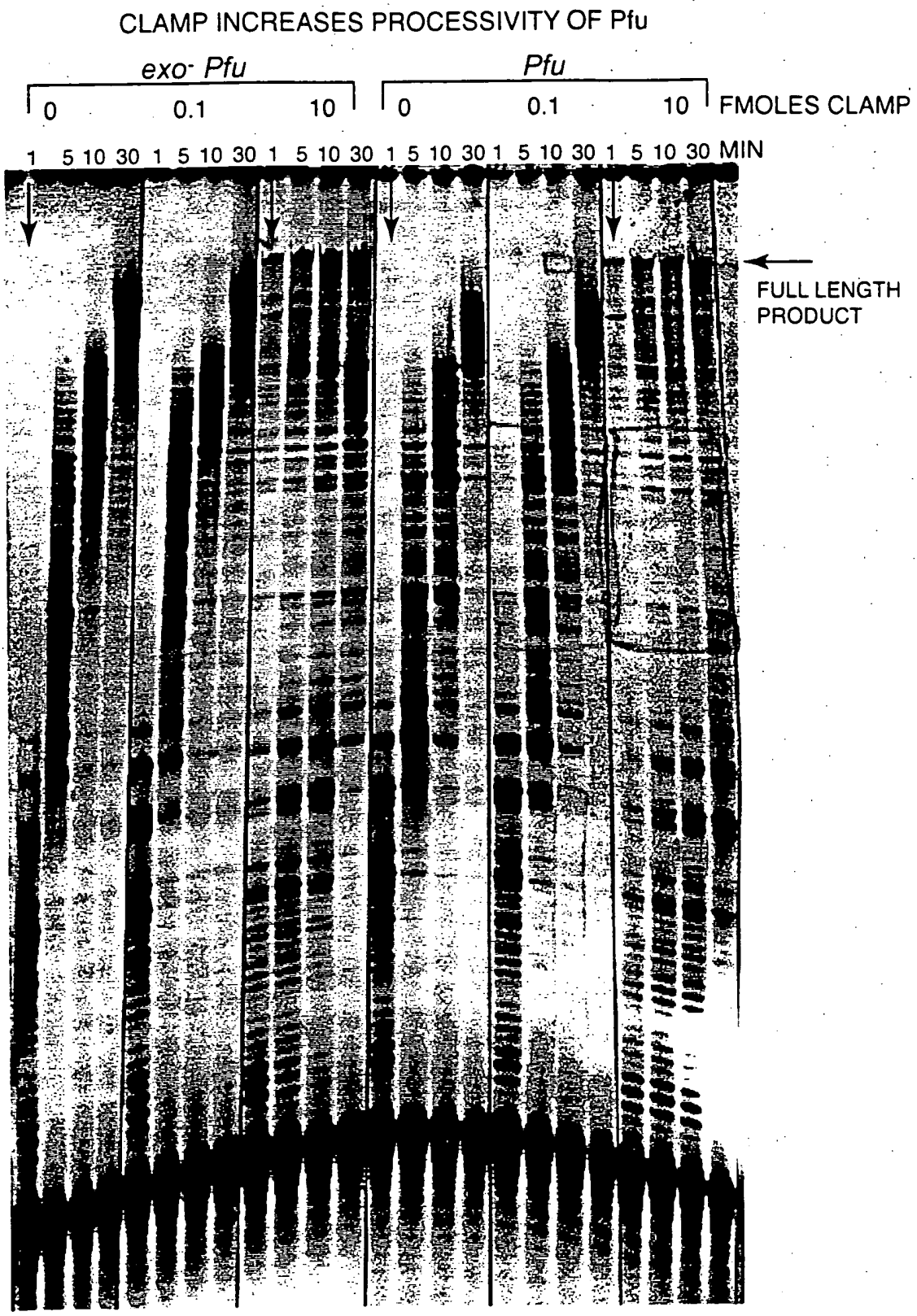
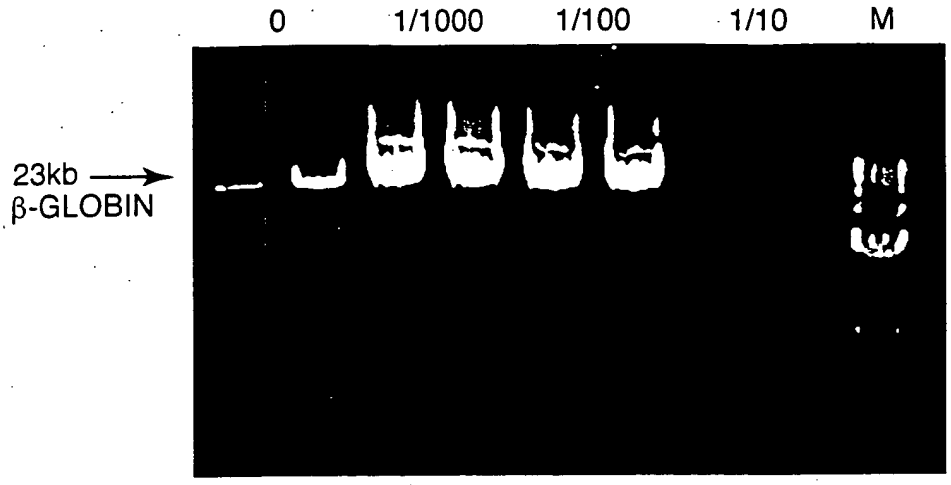
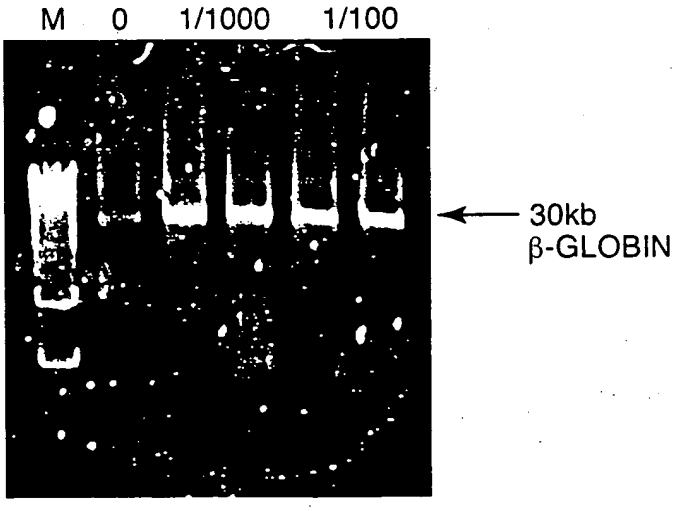

CLAMP INCREASES PROCESSIVITY OF Pfu
exo- Pfu
Pfu
0
0.1
10
0
0.1
10
FMOLES CLAMP
1 5 10 30 1 5 10 30 1 5 10 30 1 5 10 30 1 5 10 30 1 5 10 30 MIN
FULL LENGTH PRODUCT

FIG. 5



5U TPL + 1μl OF CLAMP DILUTION / 50μl PCR

FIG. 6



5U TPL + 1μl OF CLAMP DILUTION / 50μl PCR

FIG. 7

FIG. 8

ACCCAAAATTGTTATTCAGNTCAACGGAGAAGACGGAGTAGANTTGGAAGG
AGCTTATCCAGAGAAATGTTCTTAGAGAAGTTACTCTCAGCTCTCAGCTGA
TCTANNGTTTTTCCTTCTTTTCTTCTGTTCAGTTATNGCCTAGGATAAGCT
TAATAATACTTTGATACCTTTCTTAGTTTAGGTGTGTGAGAGTATGAGCGA
AGAGATTAGAGAAGTTAAGGTTCTAGAAAAACCCTGGGTTGAGAAGTATAG
ACCTCAAAGACTTGACGACATTGTAGGACAAGAGCACATAGTGAAAAGGCT
CAAGCACTACGTCAAAACTGGATCAATGCCCCACCTACTCTTCGCAGGCCC
CCCTGGTGTCGGAAAGTGTCTTACTGGAGATACCAAAGTTATAGCTAATGG
CCAACTCTTTGAACTTGGAGAACTTGTTGAAAAGCTTTCTGGGGGGAGATT
TGGACCAACTCCAGTTAAAGGGCTCAAAGTTCTTGGAATAGATGAGGATGG
AAAGCTTAGAGAGTTTGAAGTCCAATACGTCTACAAAGATAGAACTGATAG
GTTGATAAAGATAAAAACTCAGCTTGGCAGGGAGCTTAAAGTAACTCCGTA
TCACCCACTTCTAGTGATTGGAGAGAATGGCGAATTAAAGTGGATTAAGGC
TGAAGAACTCAAACTTGGCGACAAGCTTGCAATACCGAGCTTTCTCCCACT
TATAACTGGAGAAAATCCCCTTGCAGAGTGGCTTGGTTACTTTATGGGAAG
TGGCTATGCTTATCCCAAGAATTCTGTCATCACGTTCACTAACGAAGATCC
ACTCATAAGACAACGCTTTATGGAACTAACAGAGAAACTTTTCCCTGATGC
AAAGATAAGGGAAAGAATTCACGCTGATGGAACTCCAGAAGTTTATGTGGT
ATCTAGGAAAGCTTGGAGCCTTGTAAACTCTATTAGCTTAACATTAATACC
CAGGGAGGGGTGGAAAGGAATTCGTTCTTTCCTTAGGGCATATTCCGACTG
CAATGGTCGGATTGAAAGTGATGCAATAGTTTTATCAACCGATAACAATGA
TATGGCCCAGCAGATAGCCTATGCTTTAGCCAGCTTTGGAATAATAGCTAA
AATGGATGGAGAAGATGTTATTATCTCAGGCTCGGACAACATAGAGAGGTT
CCTAAATGAGATTGGCTTTAGCACCCAAAGCAAACTTAAAGAAGCCCAGAA
GCTCATTAGAAAAACCAATGTAAGATCCGATGGACTAAAGATTAACTATGA
GCTAATCTCCTATGTAAAAGACAGGCTTAGGTTAAATGTCAATGATAAAAG
AAATTTGAGCTACAGAAATGCAAAGGAGCTTTCTTGGGAACTCATGAAAGA
AATTTATTATCGCCTTGAGGAACTGGAGAGACTAAAGAAGGTCTTATCAGA
ACCCATCTTGATCGACTGGAATGAAGTAGCAAAGAAGAGTGATGAAGTAAT
AGAAAAAGCTAAAATTAGAGCAGAGAAGCTCCTAGAATACATAAAAGGAGA
GAGAAAGCCAAGTTTCAAGGAGTACATTGAGATAGCAAAAGTCCTTGGAAT
TAACGTTGAACGTACCATCGAAGCTATGAAGATCTTTGCAAAGAGATACTC
AAGCTATGCCGAGATTGGAAGAAAACTTGGAACTTGGAATTTCAATGTAAA
AACAATTCTTGAGAGCGACACAGTGGATAACGTTGAAATCCTTGAAAAGAT
AAGGAAAATTGAGCTTGAGCTCATAGAGGAAATTCTTTCGGATGGAAAGCT
CAAAGAAGGTATAGCATATCTCATTTTCCTCTTCCAGAATGAGCTTTACTG
GGACGAGATAACTGAAGTAAAAGAGCTTAGGGGAGACTTTATAATCTATGA
TCTTCATGTTCCTGGCTACCACAACTTTATTGCTGGGAACATGCCAACAGT
AGTCCATAACACTACAGCGGCTTTGGCCCTTGCAAGAGAGCTTTTCGGCGA
AAACTGGAGGCATAACTTCCTCGAGTTGAATGCTTCAGATGAAAGAGGTAT
AAACGTAATTAGAGAGAAAGTTAAGGAGTTTGCGAGAACAAAGCCTATAGG
AGGAGCAAGCTTCAAGATAATTTTCCTTGATGAGGCCGACGCTTTAACTCA
AGATGCCCAACAAGCCTTAAGAAGAACCATGGAAATGTTCTCGAGTAACGT
TCGCTTTATCTTGAGCTGTAACTACTCCTCCAAGATAATTGAACCCATACA
GTCTAGATGTGCAATATTCCGCTTCAGACCTCTCCGCGATGAGGATATAGC
GAAGAGACTAAGGTACATTGCCGAAAATGAGGGCTTAGAGCTAACTGAAGA
AGGTCTCCAAGCAATACTTTACATAGCAGAAGGAGATATGAGAAGAGCAAT
AAACATTCTGCAAGCTGCAGCAGCTCTAGACAAGAAGATCACCGACGAAAA
(cont.)

FIG. 8 (cont.)

CGTATTCATGGTAGCGAGTAGAGCTAGACCTGAAGATATAAGAGAGATGAT
GCTTCTTGCTCTCAAAGGCAACTTCTTGAAGGCCAGAGAAAAGCTTAGGGA
GATACTTCTCAAGCAAGGACTTAGTGGAGAAGATGTACTAGTTCAGATGCA
CAAAGAAGTCTTCAACCTGCCAATAGAGGAGCCAAAGAAGGTTCTGCTTGC
TGATAAGATAGGAGAGTATAACTTCAGACTCGTTGAAGGGGCTAATGAAAT
AATTCAGCTTGAAGCACTCTTAGCACAGTTCACCCTAATTGGGAAGAAGTG
ATGAAGTATGCCAGAGCTTCCCTGGGTAGAAAAATACAGGCCAAAAAAGTT
AAGTGAAATTGTAAACCAAGAAGAGGCTATAGAGAAAGTTAGAGCGTGGAT
AGAGAGCTGGTTGCATGGCCACCCCCCTAAGAAAAAAGCCCTATTATTAGC
AGGACCCCCAGGGAGCGGAAAGACAACCACAGTCTACGCTCTAGCAAATGA
GTACAACTTTGAAGTCATTGAGCTCAACGCGAGTGATGAGAGAACTTATGA
AAAAATCTCCAGGTATGTTCAAGCAGCATACACTATGGATATCCTCGGAAA
GAGGAGGAAGATAATCTTCCTCGATGAAGCAGATAATATAGAGCCCAGCGG
AGCTAAGGAAATCGCAAAACTAATTGATAAGGCCAAAAATCCAATAATAAT
GGCTGCAAATAAGTACTGGGAAGTTCCAAAAGAGATCCGAGAAAAAGCTGA
GCTAGTAGAGTACAAGAGGTTAACCCAGAGAGATGTAATGAATGCCTTAAT
AAGGATCCTAAAGAGGGAAGGTATAACAGTTCCAAAAGAAATCCTCCTAGA
AATAGCAAAAAGATCTAGTGGAGATCTAAGAGCAGCTATAAATGATCTACA
GACCGTTGTAGTGGGTGGTTACGAAGATGCTACGCAAGTTTTGGCATATAG
AGATGTAGAAAAGACAGTCTTTCAAGCCCTAGGACTCGTCTTTGGAAGTGA
CAACGCCAAGAGGGCAAAGATGGCAATGTGGAACTTGGACATGTCCCCTGA
TGAATTCCTGCTATGGGTAGATGAGAACATTCCTCACCTCTACCTAAATCC
AGAGGAGATTGCCCAGGCGTATGATGCAATTAGTAGAGCCGACATATACCT
CGGAAGGGCCGCCAGAACTGGAAACTATTCACTCTGGAAGTACGCAATAGA
TATGATGACTGCAGGAGTTGCCGTGGCAGGGAGAAAGAGAAGGGGATTTGT
CAAGTTTTATCCTCCCAACACCCTAAAGATTTTAGCGGAAAGCAAAGAAGA
AAGAGAGATCAGAGAGTCCATAATTAAAAAGATAATACGAGAGATGCNCAT
GAGTAGGCTACAGGCAATAGAAACGATGAAAATAATTAGAGAGATTTTCGA
GAACAATCTAGACCTTGCTGCGCACTTTACAGTGTTCCTTGGTCTGTCTGA
AAAAGAAGTTGAGTTTCTAGCTGGAAAGGAAAAAGCTGGTACCATTTGGGG
CAAAGCCTTAGCATTAAGAAGGAAACTTAAGGAGCTTGGAATAAGAGAGGA
GGAGAAGCCTAAAGTTGAAATTGAAGAAGAGGAAGAAGAGGAAGAAAAGAC
CGAAGAAGAAAAAGAGGAAATAGAAGAAAAACCCGAAGAAGAGAAAGAAGA
GGAGAAGAAAGAAAAGGAAAAGCcaaAGAAAGGCAAACAAGCAACTCTCTT
TGACTTTCTTAAAAAGTGATTACCCTTTTTCTTCTATTAGAGCTCCGAATA
AAGTTGGCCCTCTAATTTTTTCTATTGTCTCCTCCACATTAATCTTTACGA
ATTGGAATTCCTGCAGCCCGGGGGATCCACTAGTTCTAGAGCGGCCGCCAC
CGCGGTGGAGCTCCAGCTTTTGTTCCCTTTAGTGAGGGTTAATTTCGAGCT
TGGCGTAATCATGGTCATAGCTGTTTCCTGTGTGAAATTGTTATCCGCTCA
CAATTCCACACAACATACGAACCCGGAAGCATAAATTGTAAACCCNGGGGT
GCCTAATGANTGANCTAACTCACATTAATTGCNTTGCGCTCACTGCCCGCT
TTCCANTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGGCCAACNC
GCGGGGANAAGCGGTTGCGTATTGGGCGCTCTTCCGCTTCCTCGCTCATGA
CTCGCTGCGCTCGGTCNTCGGCTGCGGCGAACGGTATCAGCTCATCAAAGG
CGGTAATACGGTTATCCNCAAATCAGGGGATAACGCAGGAAAAAACTTTNN
ACAAAAGGCNNCAAAAGGCGGAAACTAAAAGGCGCNTTCTGGGTTTTTCNT
AGGCCCNCCCCGANAACTCNAAAAATCAACNCATTCAAGTGGGAAACCAAA
GAA

FIG. 9

PKIVIQXNGEDGVXLEGAYPEKCS*RSYSQLSADLXFFLLFFCSVXA*DK
LNNTLIPFLV*VCES(MSEEIREVKVLEKPWVEKYRPQRLDDIVGQEHIV
KRLKHYVKTGSMPHLLFAGPPGVGK[CLTGDTKVIANGQLFELGELVEKL
SGGRFGPTPVKGLKVLGIDEDGKLREFEVQYVYKDRTDRLIKIKTQLGRE
LKVTPYHPLLVIGENGELKWIKAEELKLGDKLAIPSFLPLITGENPLAEW
LGYFMGSGYAYPKNSVITFTNEDPLIRQRFMELTEKLFPDAKIRERIHAD
GTPEVYVVSRKAWSLVNSISLTLIPREGWKGIRSFLRAYSDCNGRIESDA
IVLSTDNNDMAQQIAYALASFGIIAKMDGEDVIISGSDNIERFLNEIGFS
TQSKLKEAQKLIRKTNVRSDGLKINYELISYVKDRLRLNVNDKRNLSYRN
AKELSWELMKEIYYRLEELERLKKVLSEPILIDWNEVAKKSDEVIEKAKI
RAEKLLEYIKGERKPSFKEYIEIAKVLGINVERTIEAMKIFAKRYSSYAE
IGRKLGTWNFNVKTILESDTVDNVEILEKIRKIELELIEEILSDGKLKEG
IAYLIFLFQNELYWDEITEVKELRGDFIIYDLHVPGYHNFIAGNMPTVVH
N]TTAALALARELFGENWRHNFLELNASDERGINVIREKVKEFARTKPIG
GASFKIIFLDEADALTQDAQQALRRTMEMFSSNVRFILSCNYSSKIIEPI
QSRCAIFRFRPLRDEDIAKRLRYIAENEGLELTEEGLQAILYIAEGDMRR
AINILQAAAALDKKITDENVFMVASRARPEDIREMMLLALKGNFLKAREK
LREILLKQGLSGEDVLVQMHKEVFNLPIEEPKKVLLADKIGEYNFRLVEG
ANEIIQLEALLAQFTLIGKK)**S(MPELPWVEKYRPKKLSEIVNQEEAI
EKVRAWIESWLHGHPPKKKALLLAGPPGSGKTTTVYALANEYNFEVIELN
ASDERTYEKISRYVQAAYTMDILGKRRKIIFLDEADNIEPSGAKEIAKLI
DKAKNPIIMAANKYWEVPKEIREKAELVEYKRLTQRDVMNALIRILKREG
ITVPKEILLEIAKRSSGDLRAAINDLQTVVVGGYEDATQVLAYRDVEKTV
FQALGLVFGSDNAKRAKMAMWNLDMSPDEFLLWVDENIPHLYLNPEEIAQ
AYDAISRADIYLGRAARTGNYSLWKYAIDMMTAGVAVAGRKRRGFVKFYP
PNTLKILAESKEEREIRESIIKKIIREMXMSRLQAIETMKIIREIFENNL
DLAAHFTVFLGLSEKEVEFLAGKEKAGTIWGKALALRRKLKELGIREEEK
PKVEIEEEEEEEEKTEEEKEEIEEKPEEEKEEEKKEKEKPKKGKQATLFD
FLKK)*LPFFFY*SSE*SWPSNFFYCLLHINLYELEFLQPGGSTSSRAAA
TAVELQLLFPLVRVNFELGVIMVIAVSCVKLLSAHNSTQHTNPEA*IVNP
GVPNX*XNSH*LXCAHCPLSXRETCRASCINESANXRGXAVAYWALFRFL
AHDSLRSVXGCGERYQLIKGGNTVIXKSGDNAGKNFXQKAXKGGN*KAXS
GFFXGPPRXLXKSTHSSGKPK

FIG. 10

MPELPWVEKYRPKKLSEIVNQEEAIEKVRAWIESWLHGHPPKKKALLLAG
PPGSGKTTTVYALANEYNFEVIELNASDERTYEKISRYVQAAYTMDILGK
RRKIIFLDEADNIEPSGAKEIAKLIDKAKNPIIMAANKYWEVPKEIREKA
ELVEYKRLTQRDVMNALIRILKREGITVPKEILLEIAKRSSGDLRAAIND
LQTVVVGGYEDATQVLAYRDVEKTVFQALGLVFGSDNAKRAKMAMWNLDM
SPDEFLLWVDENIPHLYLNPEEIAQAYDAISRADIYLGRAARTGNYSLWK
YAIDMMTAGVAVAGRKRRGFVKFYPPNTLKILAESKEEREIRESIIKKII
REMXMSRLQAIETMKIIREIFENNLDLAAHFTVFLGLSEKEVEFLAGKEK
AGTIWGKALALRRKLKELGIREEEKPKVEIEEEEEEEEKTEEEKEEIEEK
PEEEKEEEKKEKEKPKKGKQATLFDFLKK*

FIG. 11

MSEEIREVKVLEKPWVEKYRPQRLDDIVGQEHIVKRLKHYVKTGSMPHLLF
AGPPGVGKTTAALALARELFGENWRHNFLELNASDERGINVIREKVKEFAR
TKPIGGASFKIIFLDEADALTQDAQQALRRTMEMFSSNVRFILSCNYSSKI
IEPIQSRCAIFRFRPLRDEDIAKRLRYIAENEGLELTEEGLQAILYIAEGD
MRRAINILQAAAALDKKITDENVFMVASRARPEDIREMMLLALKGNFLKAR
EKLREILLKQGLSGEDVLVQMHKEVFNLPIEEPKKVLLADKIGEYNFRLVE
GANEIIQLEALLAQFTLIGKK**

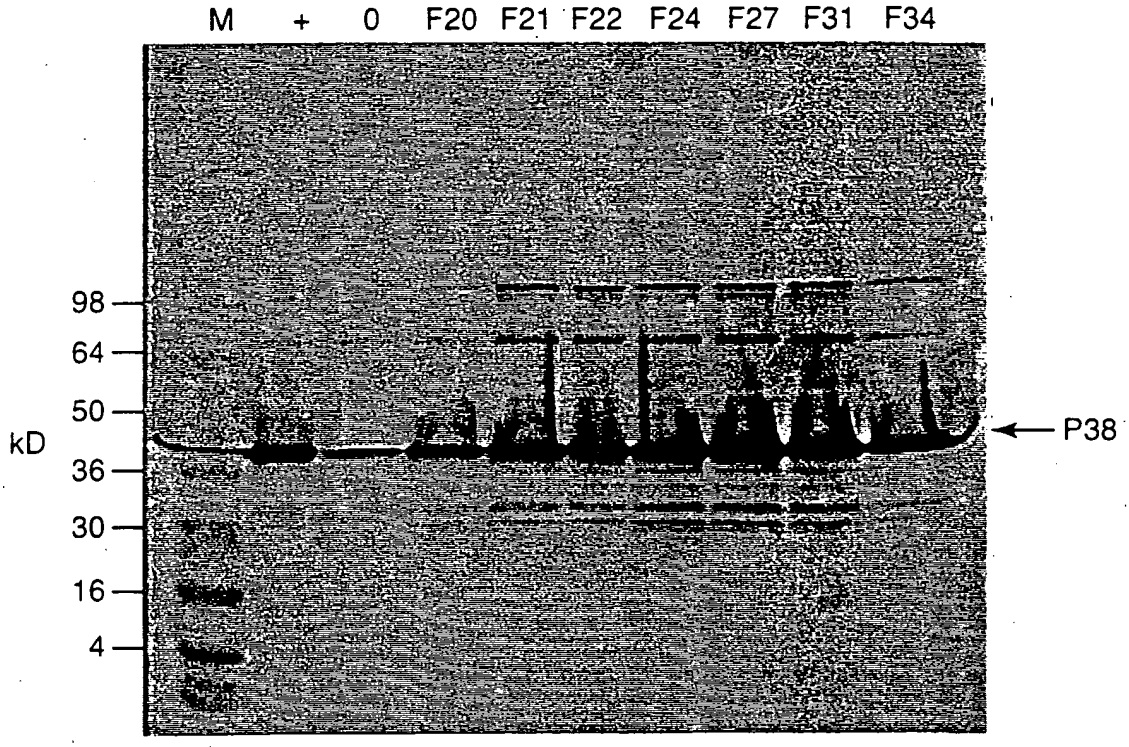


FIG. 12A

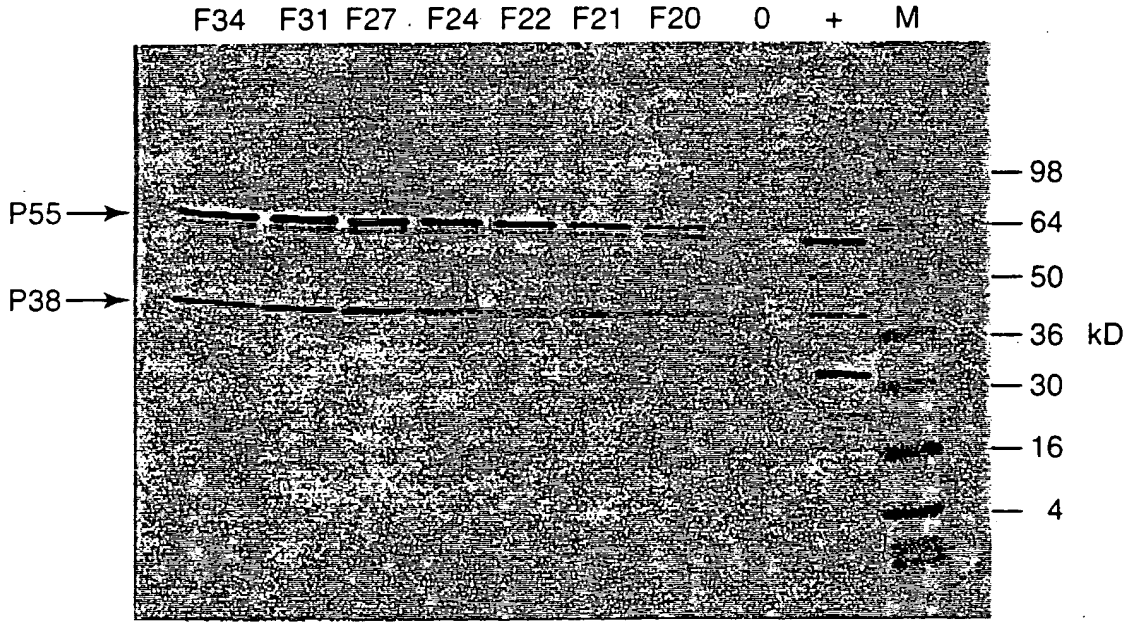


FIG. 12B

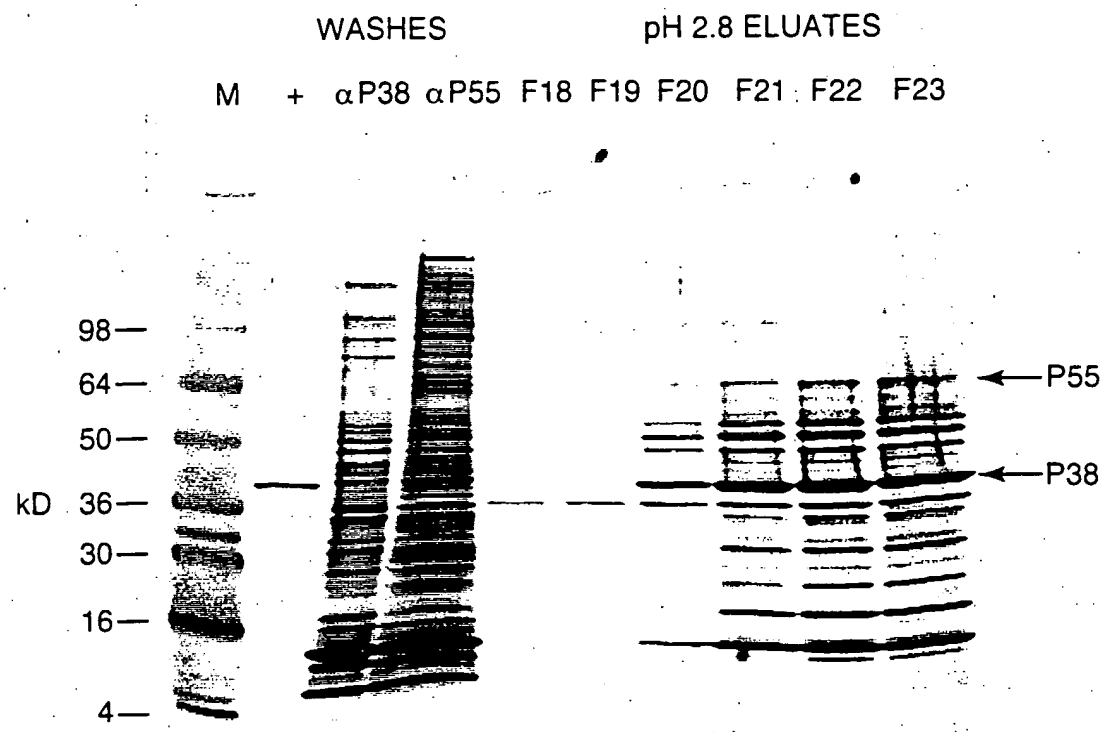
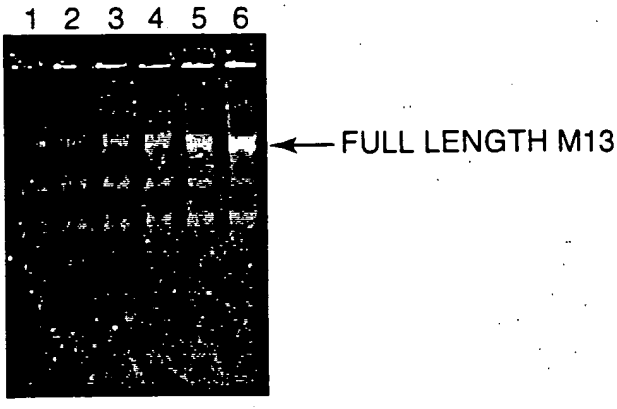


FIG. 13

NATIVE CLAMP LOADER STIMULATION OF cPfu/CLAMP PRIMER EXTENSION ON M13



VOLUME OF NATIVE CLAMP LOADER

1. 0
2. 0.01ul
3. 0.1ul
4. 0.5ul
5. 1ul
6. 2ul

FIG. 15

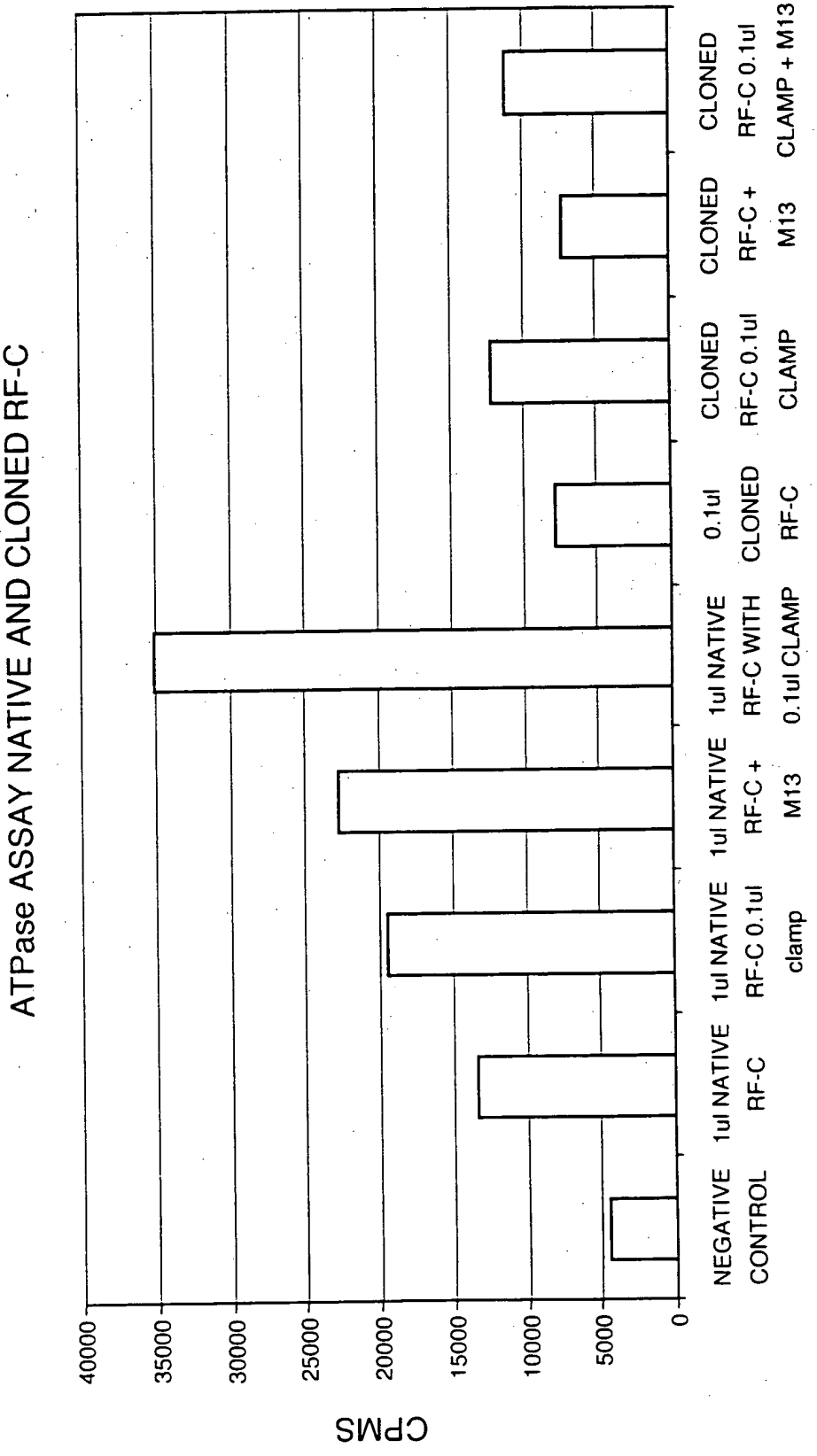

ATPase ASSAY NATIVE AND CLONED RF-C
CPMS
40000
35000
30000
25000
20000
15000
10000
5000
0
NEGATIVE CONTROL
1ul NATIVE RF-C
1ul NATIVE RF-C 0.1ul clamp
1ul NATIVE RF-C + M13
1ul NATIVE RF-C WITH 0.1ul CLAMP +M13
0.1ul CLONED RF-C
CLONED RF-C 0.1ul CLAMP
CLONED RF-C + M13
CLONED RF-C 0.1ul CLAMP + M13

FIG. 14

FIG. 16

ATGAGT$_7$GCATTTACAAAAGAAGAAATAATCAAGAGGATCCTGGAAGAAG
TGGAAGGAATAACTCTAGAAGAAATTGAGAACCAAATAAGGCAAATAATG
AGGGAAAACAATATTTCAGAGCATGCAGCTGCTCTCTTACTAGCAGAAAG
GCTGGGAGTTGAAGTTACCAAAAGAGAAGAACAACCTTTAATGAAGATTA
GCGACCTATATCCAGGAATGGATCCCCACGAGGTCAACATTGTTGGAAGA
ATACTTAAGAAGTATCCACCGCGAGAATACACAAAGAAGGATGGAAGCAT
TGGAAGGGTTGCCAGTCTAGTTATATACGATGATACTGGGAGAGCGAGGG
TTGTTCTTTGGGATTCAAAAGTTTTGGAGTATTACAGCAAGCTAGAAGTA
GGGGATGTTATTAAGGTTTTAGACGCCCAGGTTAGGGAGAGCTTATCTGG
TTTGCCTGAATTGCACATTAACTTCAGGGCTAGAATAATTAAAAACCCAG
ATGATCCTAGGGTTCAGGATATCCCACCTCTTGAAGAAGTTAGAGTGGCA
ACTTATACGAGAAAGAAGATCAGTGAGGTCGAGCCTGGGGATAGATTTGT
AGAGCTTAGGGGAACAATTGCCAAAGTTTACAGAGTTTTGGTATATGATG
CATGTCCAGAGTGTAAGAAGAAGGTTGACTATGACCCAGGAATGGACGTT
TGGATATGTCCAGAACATGGAGAGGTTGAGCCAATAAAAATCACTATTCT
TGACTTTGGGCTTGATGATGGCTCGGGATACATTAGGATTACCCTCTTTG
GAGACGATGCTGAAGAGTTGCTGGGAGTAGGGCCAGAAGAGATTGCCCAA
AAGCTTAAGGAAATGGAGAGCATGGGCATGACTCTCAAGGAGGCAGCGAG
AAAATTGGCGGAGGAAGAGTTCTACAATATAATAGGGAAAGAAATAATCG
TGAGGGGAAATGTAATTGAGGACAGGTTCTTGGGCCTAATCTTAAGGGCC
TCCTCCTGGGAAGAAGTTGACTACAAGAGAGAAATTGAGAGAATTAAGAG
GGAATTGGAAGAATTGGGGGTGATGTGA

FIG. 17

MI$_3$MSAFTKEEIIKRILEEVEGITLEEIENQIRQIMRENNISEHAAALLLA
ERLGVEVTKREEQPLMKISDLYPGMDPHEVNIVGRILKKYPPREYTKKDG
SIGRVASLVIYDDTGRARVVLWDSKVLEYYSKLEVGDVIKVLDAQVRESL
SGLPELHINFRARIIKNPDDPRVQDIPPLEEVRVATYTRKKISEVEPGDR
FVELRGTIAKVYRVLVYDA**C**PE**C**KKKVDYDPGMDVWI**C**PE**H**GEVEPIKIT
ILDFGLDDGSGYIRITLFGDDAEELLGVGPEEIAQKLKEMESMGMTLKEA
ARKLAEEEFYNIIGKEIIVRGNVIEDRFLGLILRASSWEEVDYKREIERI
KRELEELGVM

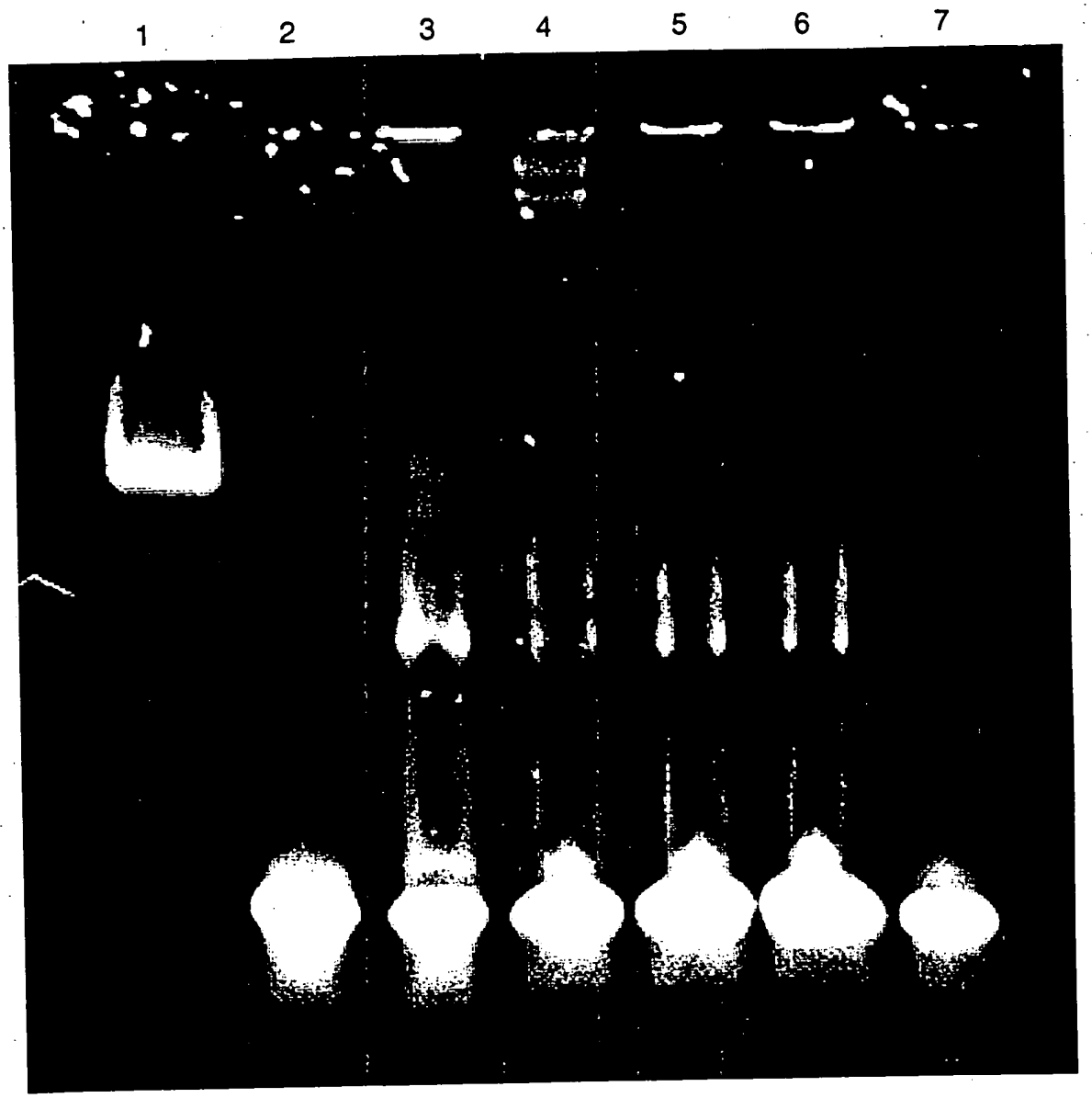
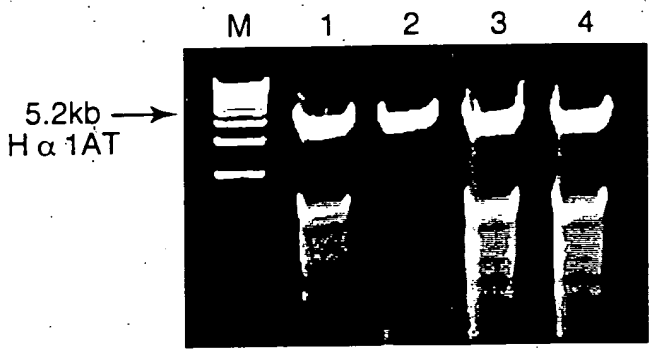


FIG. 18

Pfu TURBO WITH RFA

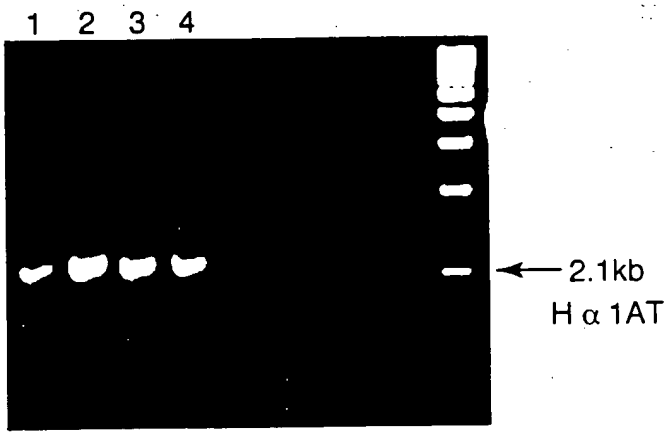


RFA/50 μl PCR RXN

1. 0
2. 1μl
3. 1μl 1/10
4. 1μl 1/100

FIG. 19

Pfu TURBO WITH RFA

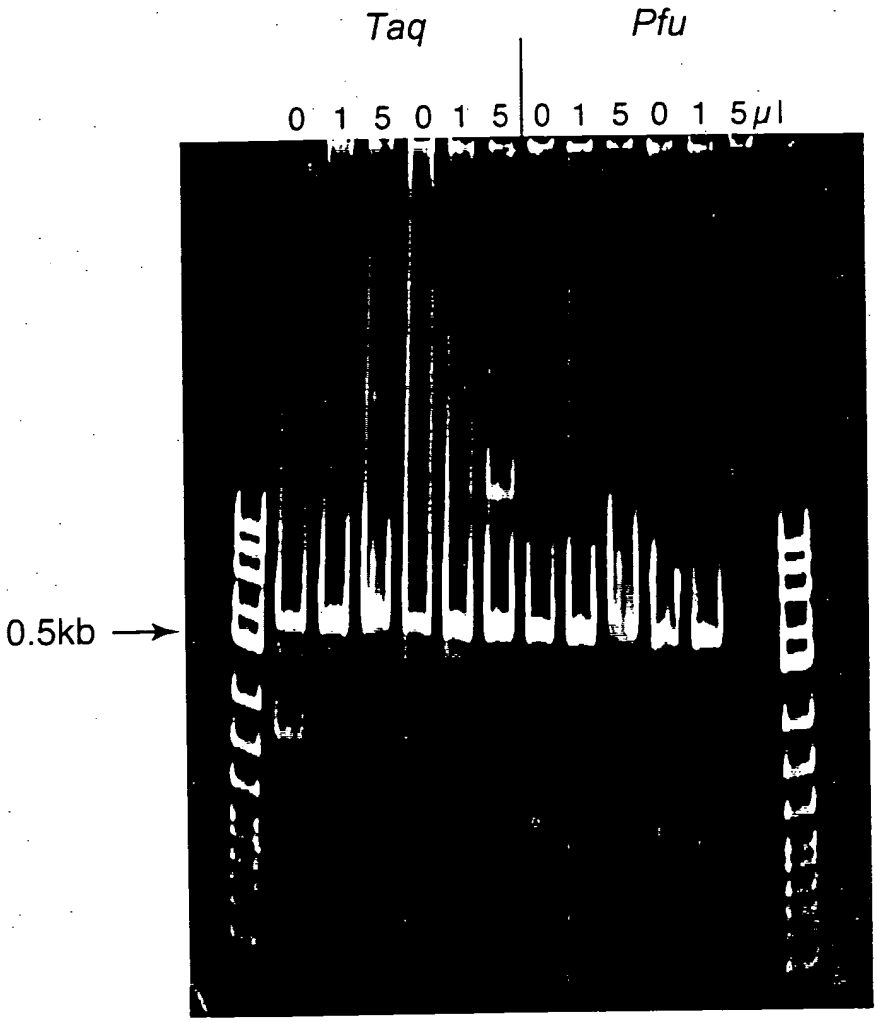


RFA/50 μl PCR RXN

1. 0 λ
2. 1 λ
3. 1 λ of 1/10
4. 1 λ of 1/100

FIG. 20

EFFECT OF RFA AND E. COLI SSB (PERFECT MATCH) ON PCRs USING Taq AND Pfu DNA POLYMERASES



RFA = P. FURIOSUS RFA
PM = STRATAGENE'S E. COLI SSB

FIG. 21

FIG. 22

ATGATTGAGGAGCTGTTCAAGGGATTAGAGAGTGAAATCGTTGGACTTCA
CGAGATTCCCCCAAAGAGGGGAGAGTATGGGGAGTTCAAATTCAGGAATG
AAGAAGTTAATGAGTTAGTTAAGAGGCTCGGATTTAGACTTTATTCTCAC
CAAGTTAAAGCCCTAGAAAAGCTGTATTCAGGGAAAAACGTAGTTGTTTC
AACGCCCACAGCTAGTGGGAAAAGCGAGATATTTAGGTTGTTTATCTTTG
ACGAAATACTGTCAAGCCCGTCCTCAACTTTTCTCTTAATCTACCCAACA
AGAGCCTTAATAAACAACCAAATGGAAAAATTCGAAAAAGAAAACACTAT
CTTTGAGGAGATTTGTGGAAAAAGAGTTCGAGCAGAAGTCTTAACTGGAG
ATACGGAATGGGAAAAGAGAAGAGAAATCATTAGGAGCAAACCAAACGTA
ATCTTCACGACACCCGATATGCTTCATCATCACATTCTTCCCAGGTGGAG
GGATTATTTCTGGCTTTTAAAGGGGCTTAGACTTCTTGTCGTGGACGAAT
TGCACGTTTATAGGGGGATCTTTGGAACAAATGTTGCTTATGTTTTCAAG
AGACTCTTTCTCAGGCTTAAGAGATTAAGTTCAAGCCCCCAAATACTTGC
CCTTTCAGCAACTTTGAGAAACCCCAAAGAATTTGCTGAACAATTTTTTG
AGACTGAATTTGAGGAGGTCAAGGAAGCTGGAAGTCCAAGCCCGAGAAGA
ATTATAGTCATGTTTGAGCCAAGAAGGTTTACTGGAGAACAACTAATCAA
GCAAATTGTTGAGAGACTAACTAGAAAGAACATAAAGACCTTGGTATTTT
TTGACTCCAGAAAGGGGACAGAAAGAATCATGAGGCTTTTCCTGTTCTCA
GATGCTTTTGATAGGATCACAACATACAAAGGGACGCTAACTAAGAGGGA
AAGGTTTCTAATAGAGAGAGACTTTAGGGAGGGCAACCTCACAGTTCTCC
TAACGACAAATGCACTCGAGTTGGGAATTGACATTGGAGATTTAGATGCA
GTAATAAACTATGGGATTCCTTCAGATGGATTGTTTTCACTAATTCAAAG
ATTTGGTAGGGCCGGAAGGGATCCAAATAGAATTGCAATAAACGGGATAA
TTTTGAGAAGAAATGGATTGGACTACTATTACAAAGAACATTTCGATGAG
CTCGTTGAGGGAATAGAAAAGGGCCTAGTGGAGAAAATCCCCGTTAACTT
GGACAATGAAAAGATAGCGAAAAAGCACCTCCACTATGCCATAGCTGAAC
TTGGAGTTGTCTCAATTAAAGAAATTGAGGGGAGATGGAAGAGATTCATA
AAGACCCTCGTAGAGGAGGGATACGTGGAAGTTACAAGAAATCCAATAAC
TGGAGAGGAAGAAATAAGACTCAGAAGACCTCCTGTCTATTCTTCAATTA
GAACGGCGAGCGATGAAAGCTACTTCTTAGTCGTGGATGAACCCTGGATA
AGGGGAGCTTTGCAGAGGAAGAGGGGAGCCGAACTTCTCCGTTTTGTAAA
CTACCTCAAAGTTAGAGGAATGGTAGTTGAGGAAGTTGATGAGATAGAAT
TCCACAGAAGTCTACTCCCTGGAATGGTCTACCTTTCAAGGGGAAGGCCC
TACATGGCAGTTGATAAGATAAAGATTGAGAAGTTCCACTTCGTTTTTGC
GAGGCCTCTTCCAATCGAAGAAGAAATAGATACTAGTTCAAGTAAAATTG
AAAACATTGAGATACTTGAGGTTAAAGACGAGAAAACTGTTGGCCCAATA
AAAGTGAAGTTCGGAAGACTTAGAGTAAGGCACGAATACACTGGATACGC
CGTGAGGGGAAGAGACGTTGAAAGGCACGTTAAGAGATTAGAAGAGCTAA
AAGATGAGGGGATACTAAGGGGAGAGATTGACATCGTCCCATACATTTGG
GAATCCTGGAAGTTTGCGAGGGTACTCTTTGACACCCCCTACATTAGAGA
GTTTGAAACTGAAGGTTTCTGGCTTGAGTTTCCAAACGATATTAGGATAG
TTCCCGAAGAGGAGTTTAGGGAATTCTTTGCAGTGGCCTCTGAGATAGAT
CCAGAGCTCGCGATGTTCCTCTACAACAGAATTAGTAGAAAATCTCTATT
CCCCACGCTTCTGGGAGCAACCACACACTACATAAGGAGTTTCATCCTTC
(cont.)

FIG. 22 (cont.)

ACCACGCCAAAGATAAGGGAGAAGAATTCGCATTTGCCGTAAAAAAGATG
ATCGACAGCAAGGATGGGATAGGCTCAGGGCTTCATGCAATTGAGCCCAA
TATAATAAAGCTTGCTCCAGTTGTGACTCATGTGGATTCGAGAGAAATAG
GCGGCTACAGCTACGATGACTTCCATGGAAAGCCAGTGATCTTCATCTAT
GATGGGAATGAAGGCGGAAGCGGAATAATTAGGCAGGTGTATGAGAACGT
AGAAAAGCTGATGTACAGGAGTTTGGAGCATATAAAGAAGTGTCCATGCA
AAGACGGCTGTCCTGCCTGCATATATTCTCCCAAGTGCGGAACTTTCAAT
GAATTCCTCGACAAGTGGATGGCAATAAGAATATGGGAAAAAGTCCTTCC
TTAA

FIG. 23

ATGTTAATAGTTGTAAGACCAGGAAGAAAAAAGAATGAGCTCGAGGCTTTTA
TAATTGAAAACCCTCCAGAAAAGCTCTCTCAAAGAAGAAATTTAAAAGCTGA
TAGGGTAGTTAGGCTCATAATGAGAGATAATAGACTTTTTAAAGCTCTTGAA
GGAAGTCAGTATTTAAATCCAAAGGAAGTGGAGAGAGCCCTTAGAAATTCAA
GGATAGTTCTGGTGAATGCCAACGAGTGGGAAGAGTACTTTAAGAAGAGGTT
AATGAACAAAAGAGTTGAAAAAGCTGACATCTGTAGGCTCTGCCTTCTCAAT
GGGAAGATTACAGTACTCACTGAGGGAAACAGGATAAGATACAGAGATGAAT
ACATATGTGAAAGTTGTGCCGAGGAGGAGTTGAAGAGAGAGTTAAGATTTCG
ATTTAATTCCATAGGAATGCTTGAACAGGCAAAGAAGCTTTTAGAGAGATTC
AGAGATTTAGACAAGGTGATTTCAATTTTTGATCCATCCTTTGACCCCACTA
AGCATCCAGAGATAACAAAATGGGATGAGCTAAAGGCCAAGCATATAAGGGT
CGAGAAGATGCATATAGATGAGCTCAACATCCCCGAAGAATTCAAAAAAGTT
CTAAAGGCCGAAGGAATAAACGAACTACTCCCCGTTCAGGTGCTAGCGATTA
AAAACGGCCTCCTAGAGGGGGAGAATTTATTGGTGGTTTCAGCAACTGCGAG
TGGAAAAACTCTAATCGGAGAGCTTGCAGGTATTCCTAAGGCTCTAAAGGGA
AAGAAAATGCTGTTCCTAGTTCCTCTAGTAGCTTTAGCAAACCAAAAGTACG
AGGACTTCAAGAGAAGATACTCAAAGCTTGGATTAAAAGTAGCCATTAGAGT
CGGAATGAGCAGGATAAAGACCAAGGAAGAGCCAATAGTTCTGGATACTGGA
ACAGATGCACACATAATAGTGGGGACTTACGAAGGAATAGACTACCTTCTCA
GAGCTGGTAAAAAGATAGGAAACGTTGGAACGGTTGTAATAGATGAAATACA
CATGCTCGATGATGAGGAGAGAGGAGCTAGGCTAGATGGGCTCATTGCAAGG
TTAAGGAAGCTCTATTCAAATGCCCAATTTATTGGGCTTTCAGCAACCGTAG
GAAACCCTCAGGAGTTAGCCAGGAAGCTAGGGATGAAACTAGTGCTTTACGA
TGAAAGGCCCGTTGACTTAGAGAGGCATTTAATAATTGCGAGAAATGAGAGT
GAGAAGTGGAGGTATATAGCTAAGCTGTGCAAAGCCGAGGCCATGAGAAAGA
GCGAGAAGGGATTCAAGGGGCAGACGATAGTATTTACATTTTCAAGGAGAAG
ATGCCATGAGCTTGCCTCATTCCTAACGGGGCAGGGATTGAAGGCTAAGGCC
TACCACTCGGGCCTCCCCTATGTTCAGAGAAAGCTTACCGAAATGGAGTTTC
AAGCTCAAATGATTGATGTAGTTGTAACAACAGCTGCTTTAGGAGCGGGAGT
TGATTTTCCAGCATCCCAAGTCATCTTCGAAAGCTTGGCCATGGGAAACAAG
TGGATAACAGTTAGGGAGTTTCACCAAATGCTTGGCAGGGCTGGAAGGCCAC
AGTACCATGAGAAAGGTAAAGTTTACATAATAGTCGAGCCTGGGAAAAAGTA
CTCAGCTCAGATGGAGGGAACTGAAGATGAAGTCGCCCTCAAGCTCTTGACT
TCACCCATAGAACCAGTAATTGTTGAGTGGAGCGATGAATTTGAAGAGGATA
ATGTCTTAGCTCATGCCTGTGTGTTTAATAGACTTAAAGTTATTGAAGAAGT
TCAATCCCTCTGCCTGGGAGCAAACCAAAGTGCTAAAAATGTTTTGGAAAAA
CTTATGGAAAAGGGGCTCGTCAAAATATATGGAGATAAAGTTGAAGCAACCC
CATATGGAAGGGCGGTGAGCATGAGTTTCCTACTTCCTAGGGAGGCAGAGTT
CATCAGAGATAACTTGGAGAGCACTGATCCAATTGAGATAGCAATTAAACTG
CTACCGTTCGAAAACGTTTACCTCCCAGGATCGCTCCAGAGGGAAATAGAGT
CAGCTGTTAGAGGAAAGATAAGCTCAAACATCTTTTCAAGCTCCTTTGCATC
AGTGCTAGAAGAGCTTGACAAGATTATACCCGAAATAAGCCCAAATGCTGCA
GAAAGGCTATTCCTAATATACCAAGATTTCTTCAACTGCCCAGAGCAAGACT
GTACGGAGTTTGCAATGGAGAGAATTGGGAGAAAGATCATTGACTTAAGAAG
AGAGGGATACGAGCCCTCAAAAATCTCTGAGCACTTTAGGAAGGTCTATGCA
TTAATATTATACCCTGGAGATGTTTTTACATGGTTAGACGGAATTGTGAGAA
AACTCGAGGCAATTGAAAGAATAGCCCGAGTGTTCAATAAGAGAAGAGTGGT
AGAAGACACAATCAGGGTTAGAAGGGAAATTGAAGAAGGAAAAATTTTGAAG
GGTGAGAGACGATGA

FIG. 24

ATGCACAAATACTTCTTTCCATTACCTGCAACTAAGTCAACTTTCTTGCTC
CCTGCCGACCTCACCACAGCAAATCCATGCTTTTCCAAGAGCTTAATCAAT
TCTCTCTCTGCCTGGGCCCCTTTTCTATACATACAATGTTTTTCCTATCTA
CCTCTTATAAACTTTTTAAACTCCTTGACATACCCTCTCGAGATGCACATA
TTGATAAAAAAGGCAATAAAAGAGAGATTTGGAAAGTTGAATGCCCTTCAA
CAATTAGCCTTTCATAAAATTAGGGGAGAAGGTAAAAGTGTTTTAATAATA
GCTCCGACAGGAAGCGGAAAAACTGAAGCCGCAGTAATTCCAATCTTAGAC
GCAATACTACGGGAGAATCTTAAACCTATAGCAGCTATTTATATAGCCCCA
TTGAAGGCACTAAATAGGGACTTGCTAGAGAGACTAAAGTGGTGGGAAGAA
AAAACTGGGGTAATAATAGAGGTTAGGCATGGGGACACGCCTACCTCAAAA
AGATTGAAGCAGGTAAAAAATCCTCCCCACCTATTAATTACAACCCCTGAA
ATGCTCCCTGCTATTCTTACGACAAAGTCCTTCCGTCCCTATCTTAAGAAC
ACTAAATTTATCGTGATAGACGAGATTGGTGAACTTATAGAGAATAAAAGA
GGAACCCAGCTAATCCTAAATCTAAAAAGACTTGAATTAATTACAGAAGAT
AAACCAATAAGGATTGGCCTTTCTGCAACAATTGGAAGTGAAGAAAAGGTA
AGGCTTTGGATGGAAGCGGATGAAGTGGTAAAGCCTCGACTAAAAAAGAAG
TACAAATTTACCGTTTTATACCCTCAGCCAATTCCAGAGGATGAAAAGCTT
GCTGAAGAGCTCAAAGTTCCAATAGAAGTTGCAACGAGGCTAAGAGTTGTG
TGGGATATTGTAGAAAAGCACAAGAAGGTATTGATCTTTGTTAATACCCGA
CAATTTGCAGAGATCTTAGGGCATAGACTTAAAGCTTGGGGAAAACCTGTT
GAAGTTCACCATGGTAGCCTTTCAAGGGAAGCAAGAATAGAGGCAGAGAAG
AAACTTAAGGAAGGAAAAATAAAAGCACTAATTTGTACCTCATCAATGGAA
CTTGGCATTGACATAGGGGATGTTGATGCAGTTATTCAGTACATGAGTCCT
CGACAGGTAAATAGGCTAGTCCAGAGAGCTGGAAGAAGCAAACATAGACTG
TGGGAAACAAGCGAGGCTTACATCATAACCACAAACGTAGAAGATTATCTC
CAAAGCTTGGCAATAGCAAAGCTCGCACTAGAAGGAAAACTGGAAGATGTA
AATCCCTACGAAAATGCCCTTGATGTCCTGGCTCACTTTATAGTTGGTTTG
ACAATAGAATACAGAAATGTTAACATTACTGAACCCTATTCCCTTGCGAAA
TCTACTTATCCCTACAGAAAGCTCTCCTGGGAAGACTATCAGAAAGTTTTA
GAGATTTTAGAAGAGGCTAGAATAATAAGAAGAGATGGAGATGCAATTAAG
CTGGGAAAAAATGCCTTTAAGTATTATTTCGAGAACCTCTCAACAATACCT
GACGAAATAAGTTATGCAGTTATAGATATTGCAAGTGGAAAATCTGTTGGA
AGACTAGATGAAAACTTTGTTACGGAACTTGAAGAGAGTATGGAATTCATC
ATGCATGGAAGAAGCTGGATCGTGCTGGAAATTAACGAAAAAGAAAGGATA
ATAAAGGTTAAGGAGAGCAACAATTTAGAAAGTGCACTGCCAAGTTGGGAA
GGGGAGCTCATTCCAGTTCCTTTGGAAGTTGCAGAATTTGTTGGAAAGCTG
AAGAGAGAGCTCCTATGGGACAAAGAGAGAGCATTAAAACTGCTTGAGGGC
GTTGAATTTAATAAGGAAGAACTCGAGGTTGCAATTTCCCAACTAGTAGAA
TCAGAACCAGTGGCGAGTGATAGAGATATCATTATAGAATCCTATCCAAAA
TTTGTGATAATTCATGCTGATTTTGGAAATAAAATTAACGAAGGGCTCACA
AGATTTATCTCAGTGTTTTTATCCGCCCGATATGGGAATATTTTCCTCCCA
AGAAGTCAAGCTCATGGAATTATAATTAGAAGCCCATTTAGGCTTAATCCT
GAAGAAATAAAGGAAATACTGTTAATGAAAGCAGAAGTTGGAGATATTGTT
GCTAGAGGAATTAGAGACACTCCAATATACCGCTGGAAGATGAGTGCAATT
GCTAAGAGATTCGGTGCCCTAAGAAGGGACGCGAGAATAAAAAAAGTAGAA
AGGCTGTTTGAAGGGACAATAATAGAGAAGGAGACTTTTAATGAAATTTAC
(cont.)

FIG. 24 (cont.)

CATGATAAAATCGACATTGATAAAACAGAGAAAATTCTAGAAAAAATAAGA
AAGGGAGAAATTAGAATGAAAACTTTGTTCAGAGAGGAAATAACGCCTCTT
TCCTCTTCTTTGGCAACCCTAGGAGGAGAGTTTCTAATTAGAGATATACTT
ACCCAGGAGGAAGTAGAAGAGATATTTAGGGAGAAGTTACTCGATGCTGAG
TTAGTCATGGTTTGTACAAACTGCGGATTTTCCTGGAGAACAAAAGTTCGC
AGGGTTATGGATAGAGTCAATGAGTTAAGCTGTCCCAAGTGTGATTCCAAA
ATGATAGCTCCTCTACACCCCAAAGATTCCGAAACTTTCATCTCAGCTCTC
AAAAAGTTAAAAAGAGGAGAAAAGCTTAGTAGGGAAGAAGAAAAGTATTAC
CTTAGAGGTTTAAAGGCGGCTGATTTACTTAAAGCCTACGGGAAGGACGCT
CTTTTAGCATTAGCTACCTATGGGGTTGGGGTAGAAAGCGCCACCAGAATA
CTTAGGGATTATAGAGGAAAATCCCTTATAAAAGCACTTATCGAGGCAGAG
AAACACTACATCCAAACTAGAAAGTTTTGGGAATAG

FIG. 25

GTGATGTTATTAAGGAGAGACTTAATACAGCCTAGGATATATCAAGAGGTA
ATATACGCCAAGTGCAAAGAAACAAACTGCTTGATTGTTCTGCCCACAGGA
TTAGGTAAGACGCTGATAGCTATGATGATAGCAGAGTATAGATTAACGAAA
TATGGCGGAAAAGTTCTAATGCTCGCCCCCACTAAGCCTCTCGTTCTTCAA
CATGCGGAAAGTTTTAGGAGGCTATTTAACCTCCCTCCAGAAAAAATTGTA
GCACTTACTGGAGAGAAGAGCCCAGAAGAGAGAAGTAAGGCCTGGGCGAGA
GCAAAAGTAATTGTAGCCACTCCTCAAACTATTGAAAATGACTTATTGGCG
GGAAGAATATCTTTAGAAGACGTTTCGCTAATAGTATTCGATGAAGCTCAC
AGAGCTGTGGGCAATTACGCTTACGTCTTTATAGCAAGAGAGTATAAAAGA
CAGGCCAAAAACCCACTTGTTATAGGGTTAACAGCCTCCCCTGGGAGCACT
CCTGAAAAGATCATGGAGGTAATAAATAACTTGGGAATTGAGCATATTGAA
TACCGCTCCGAAAATTCTCCCGATGTTAGACCTTACGTTAAGGGAATAAGG
TTTGAATGGGTTAGGGTTGATCTCCCAGAAATATACAAGGAAGTAAGGAAA
CTTTTAAGAGAAATGCTTAGAGATGCCCTTAAACCGTTGGCAGAAACTGGA
CTTCTTGAATCTTCTTCCCCAGACATTCCAAAGAAAGAAGTTCTTAGAGCT
GGGCAAATAATAAACGAAGAAATGGCGAAAGGTAATCATGATCTCAGAGGC
TTGCTTCTCTATCACGCAATGGCTCTTAAGCTACATCATGCAATTGAGCTG
TTGGAAACCCAAGGGTTATCCGCCCTGAGGGCTTATATAAAGAAGTTGTAT
GAGGAGGCAAAAGCGGGATCAACAAAGGCTAGCAAGGAAATATTCTCGGAT
AAGAGAATGAAAAAGGCAATCTCACTTTTAGTTCAAGCGAAGGAGATTGGG
CTTGATCACCCCAAGATGGACAAGTTAAAAGAAATAATTAGGGAACAACTC
CAAAGGAAACAAAATTCCAAAATCATAGTTTTCACTAACTACAGAGAAACT
GCAAAAAAGATAGTCAATGAACTTGTGAAAGATGGAATAAAAGCTAAAAGG
TTCGTTGGACAGGCCAGCAAAGAAAATGACCGTGGACTGAGTCAGAGAGAG
CAGAAATTAATTCTTGACGAATTCGCTAGAGGAGAATTCAACGTTCTAGTG
GCAACGAGTGTAGGAGAGGAAGGACTTGACGTGCCGGAAGTTGATTTGGTT
GTGTTTTATGAGCCAGTACCATCTGCCATAAGGAGCATCCAAAGAAGGGGT
AGAACTGGCAGGCATATGCCGGGGAGAGTTATAATCCTAATGGCCAAGGGG
ACTAGAGATGAAGCATACTACTGGAGTTCCAGGCAAAAGGAAAAGATAATG
CAAGAGACAATAGCTAAGGTGAGTCAGGCAATTAAAAAGCAGAAGCAAACT
TCTCTAGTTGATTTTGTGAGAGAAAAAGAGAGCGAAAAGACCTCTCTAGAC
AAGTGGTTGAAAAAGGAAAAAGAAGAAGCAACTGAAAAAGAGGAAAAGAAG
GTAAAGGCTCAAGAGGGTGTAAAAGTCGTCGTAGATAGCAGAGAGCTTAGG
AGTGAGGTTGTGAAGAGACTTAAACTTCTTGGTGTAAAGTTAGAGGTTAAA
ACGCTCGATGTGGGAGATTATATAATTAGTGAGGACGTTGCAATTGAGAGG
AAGTCAGCTAACGACTTCATTCAGTCAATTATTGATGGTAGACTTTTTGAT
CAAGTTAAGAGGCTCAAAGAGGCATACTCAAGACCGATAATGATAGTCGAA
GGTTCTTTATACGGAATTAGAAACGTCCATCCAAATGCAATAAGGGGGGCA
ATAGCAGCGGTAACCGTAGACTTTGGGGTCCCAATAATATTTTCATCTACT
CCAGAGGAAACCGCTCAATACATCTTTCTAATTGCAAAGAGGGAGCAAGAG
GAGAGAGAAAAACCTGTGAGAATTAGAAGTGAGAAGAAGGCCCTTACCCTT
GCCGAGAGGCAGAGGTTAATAGTTGAGGGATTACCTCACGTCTCAGCAACT
CTAGCTAGGAGATTGTTGAAGCACTTTGGAAGTGTGGAAAGGGTATTCACT
GCAAGCGTTGCTGAGTTAATGAAAGTTGAAGGCATAGGAGAGAAGATTGCT
AAGGAGATTAGAAGGGTAATAACTGCCCCATATATAGAGGATGAGGAGTAG

FIG. 26

TTGAAAGGGTTGTTTAGGGACGTTATCCTCCACAACCCCCACCTTTTTGTT
TATTCCTATTCTGATAAAGGCATCATTCCTTTCAAGCATCAGTTCCAGACC
CTCTATCATGCCATGCTCATGAGGCCAGTGAGGCTAATGATAGCTGATGAG
ATAGGTCTCGGAAAGACCATTCAAGCTCTTTTAATAGCCAAGTACCTCGAT
TTTAGGGGAGAGATTGAGAAAGCCTTGATAGTCGTTCCAAAAGTTCTGAGG
GAGCAGTGGAGGGAAGAAGTAAAGAGGATCTTAGAGGAAGCTCCGGAAGTG
ATAGAGAATGGTAGCGAAATTGAATGGAAGTTGAAAAGGCCGAGGAAGTAC
TTCATAATATCAATAGACCTAGCTAAGAGATACACCGAGGAAATACTCCGT
CAAAAGTGGGATTTAGTAATAGTTGACGAAGTCCACAACGCCACCCTGGGA
ACACAGAGATATGAGTTCTTAAAAGAACTAACCAAGAACAAGGATTTGAAC
GTTATATTCCTTTCAGCAACCCCCCACAGGGGAAACAATAGAGATTACCTT
GCGAGGCTTAGGCTCCTCGACCCAACTATACCAGAGGAAATATCCCCAATG
CACGAAAGGAAGATCTACATGAAGTCAAGAGGGACATTGGTACTAAGGCGA
ACTAAGAAGGTTGTCAACGAACTTGAAGGAGAAGTGTTCAAGAAGTGTCAC
TTTGGGGCTGTCGTGGTAGAAGTTAGCAGAGAGGAGAGGGAGTTCTTTGAA
GAGTTAAATAGAGCGCTATTCGAGCTGATTAAGGATCAAGCTGATTACTCT
CCCTTAACTCTTCTTGCAGTAATCATTAGGAAGAGAGCCTCGTCCAGCTAC
GAAGCGGCTCTAAAAACCCTAACCAGGATCGTTGAAAGCGCTTATATAAGT
GGGCAAGAAAGAGCCAGAGGCGTTGAATCATACATTGAAAAGATCTTTAGA
ATGGGGTATGAGGAATTGGAAATAGAAGAATTTAACGAGATAGATGATGCG
ATACACAAAATAATAGATGAATATAGGGGATTCTTAACTGAAGAGCAACTC
GAAAGGCTTAGAAGAGTTCTCGAGCTTGGAAAGAAAATTGGCAGCAAGGAT
AGCAAGCTTGAGGTTATATCCGATATAGTTGCTTATCACATTAGGAACGGC
GAAAAGGTCATAATATTCACGGAATTTAGAGATACCCTCGAATACGTACTT
GAGAGGTTACCAGATATCCTAAGGAGAAAGCACGGCATTGTTTTGGAAAAA
GATGACATTGCAAAACTTCATGGGGGCATGAAATCTGAGGAAATAGAGAGG
GAAATCAACAAGTTTCATGAAAGGGCTAACCTATTAGTCTCTACGGATGTT
GCATCCGAAGGACTTAACCTGCACGTTGCAAGTGTTGTAATAAACTACGAG
GCCCCCTGGAGCCCAATAAAGCTCGAACAGAGGGTGGGAAGAATATGGAGG
CTCAACCAAACGAGAGAAACCAAAGCATATACCATATTTCTTGCAACGGAA
ACGGACTTGGATGTTCTAAACAACCTCTATAGAAAGATTATGAACATAAAG
GAAGCCGTGGGAAGTGGACCCATTATTGGAAGGCCAATATTTGAAGGAGAC
TTTGAAAATCTATGGAATGAAGGTGCCGAGGAAGAAAATAGAGAAGTCTCA
GAGTATGAGCTTATCCTAGCCTCAATTAAGGGAGAACTCAAGGGCTATGCC
GGGGCTCTAGTTAGGACTCTCAGAATCCTAAAGCAGAAAGTGGAGGGAGCA
GTTCCTGTAAATCCTGCGGGAAGCATAAGGAGAGAGCTCGAGATAATTTTA
GAGGACACTCCTGATGTGGAAGTATTAAAGAAAATCGTTAATAGGAACGTT
CCAAATCCGTTCCGCTTGGTGAGAGGACTTTTAAGAGAAGCCGAGGGGATT
GAGGGAATTAGAGTATTAGTTAAGGGCTATGATGGCTCTATGGATGTGTAC
TATGCCATATTCTACGACGAAGATGGGAGAGAAATTTATAGATATCCAATT
CTTGCTGAGAACGGAAAGTACCTTGTTGGATTCAACTTACTCAAGAGGATT
AGTGAGGTACTATCCAAAGAGTACAAGGTCGTTAGAGGGGCAAGTGAAGAG
GTGGACTATAAAGTTAAGACGCTAGTTATGGACAACATATACAATTTAATC
GTGAAGAAGTATCTGGAATACGATAGCTTAAACATCAAAGAAGGTAAAATC
TTCAAGAGGCTTAAGGTTGAAATAAAGAAAGCCCTCGAGGTAAAGGGGATA
(cont.)

FIG. 26 (cont.)

AGTGAAGAAGAATTCGAAGTCATCAAGAGAGTTCCCCCTGAGATTATGGAA
GTTCTAGGGTTAGATTCCACAAAAATAGAACTACCTACCAACGAATACCTC
AAGATCTTCGAAAGGAACTTTGTTCCTCTGGATAAAATCCTTGAGAGTGAA
AAGAAGGCCATGGAAATAGTCATGGAGCTAGAGAAGAGCAGAGGATATAAC
GTTGAGGACGTATCTTTAAGGGAGCACTATGACATAAGGGCCTTTACAGAT
GGTGAAGAGAAGTACATAGAGGTCAAAGGCCACTATCCAATGCTCCTACTT
GCGGAGTTAACGGAAAAGGAATTTGAGTTCGCACAAAAAAATGAAGATAAG
TACTGGATATACATAGTCTCGAACATTGCCAAAGACCCCGTAATTGTAAAA
ATTTACAAACCATTTTCCCAGGATAGAAGAGTATTCGTGGTTAAGAATGGG
GAAGATGTTGAGGTTAATATCAACATTGAGATAAAGAAGAAAGATAGGCAT
TTACTTAAGTTAAGCTAG

FIG. 27

GTGATTACTTTGGAGCTACATCCAAGTGAGATAGCTAGATATTTCGAGCTT
GAAGAGTGTTCCCACTATTTCTCTAACCTACTTTTAAGAAAGAGAGGCGAA
TTGCAGGAATTTGAGCCGATAATAAGGAGAAAAGAAATAGAAACCATAGAG
CTCGCCAAATGGGGAGACGAGTTCGAGCTCTCCCTTCTTCAGGAATTTAAA
AAAGGTGAAGCATTAAAAAAGCTTGGAGTTAAAGAACTACCAAGATTCTAT
GGTTTTTTAACGGAAAACGACACCCCTGTAAGAAAGTTCTTTGAAAAGTAC
TTTAAAGATGGAATAATAGTGGAAGAAGATCCAGACAAACTTTTAGAAATT
ATAAACAGTGAGAAAAGTGCCGTTATCTATCAAGCCCCCTTAAAAGGCAGA
ATAGGGAAATTTGATGTCTCAGGAAGGGCAGACTTCATAATAAAGGTTGGG
AAAACACTTTACCTACTCGAGGCTAAGTTTACTAAGGAAGAGAAGTTCTAC
CACAGGATTCAGGCCATTATCTATGCTCACCTTCTAAGTCAAATGATCGAA
GGTTACGAAATTAAACTAGCTGTTGTAACAAAGGAGAACTTTCCCATTCCC
TCAAACTTCCTAAGATTCCCAGGAGACGTGGAAGAGTTAAAGATAACCCTA
GAAGAAAAGCTTGGTGGAATACTAAGAGAACAAGAACTTTGGATAGACGCA
AGGTGTACTACTTGCCCCTTTGAGGCTTTATGCTTGTCTAAGGCTCTTGAG
GAAAGAAGTCTAGGACTATTAAGCCTTCCCCCTGGGATAATTAGAATACTC
AAAGAAGAAGGGATAAAAGACTTAAAAGACATGGCTAAGCTATTTGAATTC
AAAGAAAATTCCCCTACAAACTTTGAAGAGCCCTCAATAAAAGATCCAAAG
AAGACTCAAGAGATAGCAAAAAGAACGGGAATAAACTTACTAAAGCTCTCA
AGGATAGCTCAGGCAATCCTTAAATATTTAGATGAGGGAGAAACAACACCC
CTGTTCATCCCCAGGACGGGGTATAATCTGCCAATGGATGAGAGAGTAGGT
GATGTTGAGCCCTCTTACTATCCTCCAAGGAGCTTAGTGAAAGTGTTCTTC
TATGTCCAGACAAGCCCAATAACAGACACAATAATCGGAATTTCAGCCCTT
GTAAAGAATAGGCAAAATGGAGAGCGGATAATTGTTAAGTTCGTCGATGAG
CCCCCCATAGAAGTTTCAGATGCCCAAGAAAAGGAGAGAATGCTTCTAATT
GAGTTCTTTAGGGATGTTATTGATGCCGTAAAGTCACTATCTCCAACCGAT
AAAGTCTACCTACACATGTACTTTTACAATAGAAAACAGAGAGATGACCTT
ATGGATGCCGTAAAGAGACACAAAGAGATAAGAGAAAACAATGCAGTCATG
GCCTTGCTAAGCTTGAGAAGAGCCATAGATTGGGAGAGCTTTTCAATAATA
AAGGATGAGATAATAAGGAGGCATGCCTTACCACTTTCTCCTGGCCTGGGA
TTCGTTACAGTTGCTACTCAGTTTGGATACAGATGGAGAAGGAACAAAACC
TTTGCGCGAATGCTTGAGGTTGTAGCAAGAAGAGAAAATGGTAAGATAAAT
CTCAAAACTCTCCTTAACATTTCTGAAACGGGAATTGGGCCAGAATATTAT
CCAATCATCGATAGGGATAACGAAGGAATACCCTTCACACTTTTCTGGAGC
GCACTGGTCAAATTAGCTACTGAGGAAGACAATTCAAGAATTAAGAGGGAT
ATAAGGGACATACTCTCCCAAATGGTTGAGGCCCTCAAAACAATTGAAGAG
AGAATTCCCGAGCAATATAAAGACGCCTTCGTGAAAAAAGAGGGAATACCC
AAAGAAGATCTCGAAAACTTTGACATAAAGAAGGAAGAATTAGCTGATATC
CTTCTTGAATACTTACAATTAGAGTTCGATGCAAGATTTAGAGAACGATCC
GAATACTATAGGCTTCCCCTATCAATAAGAGCATACTCAGAGGAATCAGCA
CTAATTAAGATAGAAAACATTGAAAAGAAGAAAAATGACTGTCTGTTGTTT
GGAAAAATCGTGCTAATTGACGAAAATGGAAGAATAAAAGAGTATAATCCA
AAAGAAGTTCTTATAGATATTGATGAAGGTTCTCTTGTAGTTGTAACGCCA
AAGAAATTCTTAGATAAGCTAAGAAGAGATCCCGTTCAAAGAATAAGCAAA
TCACCGTTAGGAATAGTTGAGGCTATAGATCACGAGACAGGAAAAGTTGTT
ATAAGGTTAATAAGAGTCTCTCCAGGCAGATTTACACTCAAACACTCTAAG
(cont.)

FIG. 27 (cont.)

TTTAGTTGTAAAAATGGACTATTGACAATAACCTATCCTGAAGGGGAAGTG
AAAGTTACTCCTGGAGAGATAGTTATAGTAGATCCTAGCGTCGATGACATA
GGAATGGAAAGGGCATACAATGTGCTCTCAGAAATATCCCAAGGGGAACTC
AAGCATGAAATTTATCAGAAGGTCAAAGCAATATACGAAGGGAACACGGAA
TCAAGATACGAAGTCAACATCTGGAAGAAAAAGCACATAGAAGAATTTCTC
TCCAGAGTTAAGAAGATCAACGAAGAACAGAAAAAGTTTGCAATTGACATA
AACAACTTTCTAGTCACCCTTCAAGGCCCCCCTGGGACTGGGAAGACATCA
GGGGCCATAGCCCCAGCAATTCTCGCAAGAGCATATTCAATGGTGAAGGAC
AAAAAGAATGGCCTCTTTGTAGTTACTGGAGTCTCACACAGGGCAGTTAAT
GAGGCCCTGATAAAGACTTTAAAGCTAAAGAAAGAGCTGGAGAATACATTA
AAAGAGCTTAGAAAGATAGATCTAATTAGAGCAGTCTCTGGGGAAGAGGCA
ATCAAAATAATTAAAGAGGAACTAGAGAGGGAAATAAAGGATGATGTCGAC
AGAATTAGATTTACAGCACAAGAAATTACCCACTCTTCAAAGCAAAGATCA
TTAGACAAATATTTTGCTAATTCTGGAACTGTGAGGATAGTATTTGGAACA
CCACAGACTTTGAACAAGCTTATGAAGAATACAAAAGAAGTCGAACTAGTT
GTCATAGATGAAGCTAGTATGATGGACTTACCAATGTTCTTCCTCTCAACA
AAAGTTTGTAAAGGTCAAGTTCTCTTGGTCGGGGATCACAGGCAGATGGAG
CCAATTCAAGTCCATGAATGGCAATTAGAGGACAGAAAGACATTTGAAGAG
CACTATCCATTCCTTTCAGCCCTTAACTTCATTAGATTTCTCAGGGGAGAG
TTGGATGAAAGAGAACTTAAGAAGTTTAAGAGAATCCTTGGAAGGGAACCT
CCAGAATGGAAGAAGGACAAGAACGAGGTTCTCCCTCTCTATAGGTTAGTA
AGAACTTATAGGTTGCCCCAGGAAATAGCTGATCTACTGAGTGATGCAATA
TACAGAGCAGATGGCATAAAATTGATTAGTGAAAAGAAAAAGAGGAGAAAG
ATAATTGCCAGGCACAAGGATGAGTTTCTATCGATAGTTTTAGATGACAGG
TATCCTTTCGTTCTAATACTTCATGACGAGGGCAATTCCACAAAGATTAAC
GAGCTGGAAGCAAAGATAGTAGAGAAGATAATCAAAAGAGTAGAGAATATT
GATATAGGAGTTGTAGTTCCATATAGAGCTCAAAAGAGATTAATAGCTTCA
TTAATAGATAGTGCCCAGGTGGACACAGTTGAGAGATTCCAAGGGGGAGAG
AAATCTTTAATAGTAATTTCAATGACTTCCAGCGACCCCCGCATACCTGGG
AAAGGTTTTTGA

FIG. 28

ATGAACATAAAGAGCTTCATAAACAGGCTTAAGGAGCTAGTTGAAATCGAG
AGGGAAGCTGAAATAGAGGCTATGAGGTTGGAGATGAAAAGGCTTAGCGGA
GTGGAGAGGGAGAGGTTAGGTAGGGCAATTCTCAGCTTAAACGGTAAAATC
GTTGGTGAAGAGCTCGGTTATTTCTTGGTTAAGTACGGAAGGAATAAGGAG
ATAAAGACCGAGATCAGCGTTGGGGATTTGGTTGTTATAAGCAAGAGGGAT
CCCCTGAAGAGCGACCTCCTGGGAACTGTTGTTGAGAAGGGGAAGAGATTC
ATCGTCGTTGCCTTAGAACCAGTCCCAGAGTGGGCCCTTAGAGATGTGAGG
ATAGACCTCTACGCCAACGATATAACATTCAAGAGGTGGATCGAAAACCTC
GACAGGGTTAGGAAGGCTGGAAAAAAGGCTTTAGAGTTTTACTTAGGTTTA
GATGAGCCTTCCCAGGGGGAGGAAGTGAGCTTTGAACCCTTTGATAAGAGC
CTAAACCCCTCTCAAAGGAAAGCGATAGCTAAGGCTTTAGGTAGTGAAGAC
TTCTTCCTTATCCACGGCCCCTTTGGAACTGGAAAGACGAGGACTTTAGTT
GAGCTGATTAGGCAGGAGGTAAAGAGGGGGAACAAAGTTCTAGCTACAGCT
GAGAGCAACGTTGCCGTGGACAATTTAGTTGAAAGATTGGCCAAAGATGGA
GTTAAGATAGTTAGGGTTGGGCACCCAAGTAGGGTTTCGAGGCATTTGCAC
GAGACAACTTTAGCTTACCTCATTACTCAGCACGAGCTCTACGGTGAGCTT
AGGGAGCTTAGGGTGATAGGGCAGAGTTTGGCAGAGAAGAGGGACACATAT
ACAAAGCCGACTCCAAAGTTCAGGAGGGGACTGAGTGATGCTGAGATAATT
AAGTTGGCCGAGAAGGGAAGAGGGGCTAGAGGACTCTCAGCTAGACTAATA
AAGGAGATGGCCGAGTGGATAAAGCTAAACAGGCAGGTTCAGAAGGCCTTT
GAAGATGCTAGAAAGCTTGAGGAGAGGATTGCGAGGGATATAATTAGGGAA
GCCGATGTGGTTTTGACAACTAACTCTTCTGCAGCCCTTGATGTTGTTGAT
GCTACCGATTATGATGTTGCGATAATAGATGAAGCAACTCAGGCAACTATA
CCGAGCATATTAATACCTCTCAACAAGGTTGATAGGTTTATACTTGCTGGA
GACCACAAGCAACTACCACCAACTATCTTAAGCTTGGAGGCCCAGGAGCTC
TCCCACACGCTTTTCGAGGGTTTAATTGAGAAGTACCCATGGAAGAGCGAA
ATGCTGACAATTCAGTATAGGATGAATGAGAGGATAATGGAGTTTCCGAGC
AGGGAGTTTTACGATGGAAGAATAGTTGCTGATGAAAGTGTAAAAAACATA
ACTCTGGCCGACCTGGGAATTAAAGTTAATGCTAGTGGAATATGGAGGGAC
ATCCTAGATCCAAACAACGTCCTCGTGTTCATAGATACTTGCATGCTCGAA
AATAGGTTCGAGAGGCAGAGAAGGGGAAGCGAAAGCAGGGAGAATCCCTTG
GAGGCCAAGATAGTGAGCAAAATCGTTGAAAAGCTCTTGGAAAGTGGGGTT
AAAGCGGAAATGATGGGAGTGATTACACCTTACGATGACCAGAGGGATTTG
ATAAGCTTGAATGTTCCCGAAGAAGTTGAGGTCAAGACTGTGGATGGTTAC
CAGGGAAGGGAGAAGGAAGTGATAATTCTATCATTTGTCCGCTCTAACAAA
GCGGGAGAGATCGGCTTTCTCAAGGACTTGAGGAGGCTAAACGTGTCCTTA
ACTAGGGCTAAGAGGAAGCTTATCATGATTGGCGATTCCTCAACGCTTTCA
TCTCACGAAACCTACAGGAGGTTAATCGAGCACGTGAGGGAGAAGGGGTTA
TATGTTGTGCTAACGAAGGATAGCATTTGA

FIG. 29

MIEELFKGLESEIVGLHEIPPKRGEYGEFKFRNEEVNELVKRLGFRLYSHQ
VKALEKLYSGKNVVVSTPTASGKSEIFRLFIFDEILSSPSSTFLLIYPTRA
LINNQMEKFEKENTIFEEICGKRVRAEVLTGDTEWEKRREIIRSKPNVIFT
TPDMLHHHILPRWRDYFWLLKGLRLLVVDELHVYRGIFGTNVAYVFKRLFL
RLKRLSSSPQILALSATLRNPKEFAEQFFETEFEEVKEAGSPSPRRIIVMF
EPRRFTGEQLIKQIVERLTRKNIKTLVFFDSRKGTERIMRLFLFSDAFDRI
TTYKGTLTKRERFLIERDFREGNLTVLLTTNALELGIDIGDLDAVINYGIP
SDGLFSLIQRFGRAGRDPNRIAINGIILRRNGLDYYYKEHFDELVEGIEKG
LVEKIPVNLDNEKIAKKHLHYAIAELGVVSIKEIEGRWKRFIKTLVEEGYV
EVTRNPITGEEEIRLRRPPVYSSIRTASDESYFLVVDEPWIRGALQRKRGA
ELLRFVNYLKVRGMVVEEVDEIEFHRSLLPGMVYLSRGRPYMAVDKIKIEK
FHFVFARPLPIEEEIDTSSSKIENIEILEVKDEKTVGPIKVKFGRLRVRHE
YTGYAVRGRDVERHVKRLEELKDEGILRGEIDIVPYIWESWKFARVLFDTP
YIREFETEGFWLEFPNDIRIVPEEEFREFFAVASEIDPELAMFLYNRISRK
SLFPTLLGATTHYIRSFILHHAKDKGEEFAFAVKKMIDSKDGIGSGLHAIE
PNIIKLAPVVTHVDSREIGGYSYDDFHGKPVIFIYDGNEGGSGIIRQVYEN
VEKLMYRSLEHIKKCPCKDGCPACIYSPKCGTFNEFLDKWMAIRIWEKVLP

FIG. 30

MLIVVRPGRKKNELEAFIIENPPEKLSQRRNLKADRVVRLIMRDNRLFKAL
EGSQYLNPKEVERALRNSRIVLVNANEWEEYFKKRLMNKRVEKADICRLCL
LNGKITVLTEGNRIRYRDEYICESCAEEELKRELRFRFNSIGMLEQAKKLL
ERFRDLDKVISIFDPSFDPTKHPEITKWDELKAKHIRVEKMHIDELNIPEE
FKKVLKAEGINELLPVQVLAIKNGLLEGENLLVVSATASGKTLIGELAGIP
KALKGKKMLFLVPLVALANQKYEDFKRRYSKLGLKVAIRVGMSRIKTKEEP
IVLDTGTDAHIIVGTYEGIDYLLRAGKKIGNVGTVVIDEIHMLDDEERGAR
LDGLIARLRKLYSNAQFIGLSATVGNPQELARKLGMKLVLYDERPVDLERH
LIIARNESEKWRYIAKLCKAEAMRKSEKGFKGQTIVFTFSRRRCHELASFL
TGQGLKAKAYHSGLPYVQRKLTEMEFQAQMIDVVVTTAALGAGVDFPASQV
IFESLAMGNKWITVREFHQMLGRAGRPQYHEKGKVYIIVEPGKKYSAQMEG
TEDEVALKLLTSPIEPVIVEWSDEFEEDNVLAHACVFNRLKVIEEVQSLCL
GANQSAKNVLEKLMEKGLVKIYGDKVEATPYGRAVSMSFLLPREAEFIRDN
LESTDPIEIAIKLLPFENVYLPGSLQREIESAVRGKISSNIFSSSFASVLE
ELDKIIPEISPNAAERLFLIYQDFFNCPEQDCTEFAMERIGRKIIDLRREG
YEPSKISEHFRKVYALILYPGDVFTWLDGIVRKLEAIERIARVFNKRRVVE
DTIRVRREIEEGKILKGERR

FIG. 31

MHKYFFPLPATKSTFLLPADLTTANPCFSKSLINSLSAWAPFLYIQCFSYL
PLINFLNSLTYPLEMHILIKKAIKERFGKLNALQQLAFHKIRGEGKSVLII
APTGSGKTEAAVIPILDAILRENLKPIAAIYIAPLKALNRDLLERLKWWEE
KTGVIIEVRHGDTPTSKRLKQVKNPPHLLITTPEMLPAILTTKSFRPYLKN
TKFIVIDEIGELIENKRGTQLILNLKRLELITEDKPIRIGLSATIGSEEKV
RLWMEADEVVKPRLKKKYKFTVLYPQPIPEDEKLAEELKVPIEVATRLRVV
WDIVEKHKKVLIFVNTRQFAEILGHRLKAWGKPVEVHHGSLSREARIEAEK
KLKEGKIKALICTSSMELGIDIGDVDAVIQYMSPRQVNRLVQRAGRSKHRL
WETSEAYIITTNVEDYLQSLAIAKLALEGKLEDVNPYENALDVLAHFIVGL
TIEYRNVNITEPYSLAKSTYPYRKLSWEDYQKVLEILEEARIIRRDGDAIK
LGKNAFKYYFENLSTIPDEISYAVIDIASGKSVGRLDENFVTELEESMEFI
MHGRSWIVLEINEKERIIKVKESNNLESALPSWEGELIPVPLEVAEFVGKL
KRELLWDKERALKLLEGVEFNKEELEVAISQLVESEPVASDRDIIIESYPK
FVIIHADFGNKINEGLTRFISVFLSARYGNIFLPRSQAHGIIIRSPFRLNP
EEIKEILLMKAEVGDIVARGIRDTPIYRWKMSAIAKRFGALRRDARIKKVE
RLFEGTIIEKETFNEIYHDKIDIDKTEKILEKIRKGEIRMKTLFREEITPL
SSSLATLGGEFLIRDILTQEEVEEIFREKLLDAELVMVCTNCGFSWRTKVR
RVMDRVNELSCPKCDSKMIAPLHPKDSETFISALKKLKRGEKLSREEEKYY
LRGLKAADLLKAYGKDALLALATYGVGVESATRILRDYRGKSLIKALIEAE
KHYIQTRKFWE

FIG. 32

VMLLRRDLIQPRIYQEVIYAKCKETNCLIVLPTGLGKTLIAMMIAEYRLTK
YGGKVLMLAPTKPLVLQHAESFRRLFNLPPEKIVALTGEKSPEERSKAWAR
AKVIVATPQTIENDLLAGRISLEDVSLIVFDEAHRAVGNYAYVFIAREYKR
QAKNPLVIGLTASPGSTPEKIMEVINNLGIEHIEYRSENSPDVRPYVKGIR
FEWVRVDLPEIYKEVRKLLREMLRDALKPLAETGLLESSSPDIPKKEVLRA
GQIINEEMAKGNHDLRGLLLYHAMALKLHHAIELLETQGLSALRAYIKKLY
EEAKAGSTKASKEIFSDKRMKKAISLLVQAKEIGLDHPKMDKLKEIIREQL
QRKQNSKIIVFTNYRETAKKIVNELVKDGIKAKRFVGQASKENDRGLSQRE
QKLILDEFARGEFNVLVATSVGEEGLDVPEVDLVVFYEPVPSAIRSIQRRG
RTGRHMPGRVIILMAKGTRDEAYYWSSRQKEKIMQETIAKVSQAIKKQKQT
SLVDFVREKESEKTSLDKWLKKEKEEATEKEEKKVKAQEGVKVVVDSRELR
SEVVKRLKLLGVKLEVKTLDVGDYIISEDVAIERKSANDFIQSIIDGRLFD
QVKRLKEAYSRPIMIVEGSLYGIRNVHPNAIRGAIAAVTVDFGVPIIFSST
PEETAQYIFLIAKREQEEREKPVRIRSEKKALTLAERQRLIVEGLPHVSAT
LARRLLKHFGSVERVFTASVAELMKVEGIGEKIAKEIRRVITAPYIEDEE

FIG. 33

LKGLFRDVILHNPHLFVYSYSDKGIIPFKHQFQTLYHAMLMRPVRLMIADE
IGLGKTIQALLIAKYLDFRGEIEKALIVVPKVLREQWREEVKRILEEAPEV
IENGSEIEWKLKRPRKYFIISIDLAKRYTEEILRQKWDLVIVDEVHNATLG
TQRYEFLKELTKNKDLNVIFLSATPHRGNNRDYLARLRLLDPTIPEEISPM
HERKIYMKSRGTLVLRRTKKVVNELEGEVFKKCHFGAVVVEVSREEREFFE
ELNRALFELIKDQADYSPLTLLAVIIRKRASSSYEAALKTLTRIVESAYIS
GQERARGVESYIEKIFRMGYEELEIEEFNEIDDAIHKIIDEYRGFLTEEQL
ERLRRVLELGKKIGSKDSKLEVISDIVAYHIRNGEKVIIFTEFRDTLEYVL
ERLPDILRRKHGIVLEKDDIAKLHGGMKSEEIEREINKFHERANLLVSTDV
ASEGLNLHVASVVINYEAPWSPIKLEQRVGRIWRLNQTRETKAYTIFLATE
TDLDVLNNLYRKIMNIKEAVGSGPIIGRPIFEGDFENLWNEGAEEENREVS
EYELILASIKGELKGYAGALVRTLRILKQKVEGAVPVNPAGSIRRELEIIL
EDTPDVEVLKKIVNRNVPNPFRLVRGLLREAEGIEGIRVLVKGYDGSMDVY
YAIFYDEDGREIYRYPILAENGKYLVGFNLLKRISEVLSKEYKVVRGASEE
VDYKVKTLVMDNIYNLIVKKYLEYDSLNIKEGKIFKRLKVEIKKALEVKGI
SEEEFEVIKRVPPEIMEVLGLDSTKIELPTNEYLKIFERNFVPLDKILESE
KKAMEIVMELEKSRGYNVEDVSLREHYDIRAFTDGEEKYIEVKGHYPMLLL
AELTEKEFEFAQKNEDKYWIYIVSNIAKDPVIVKIYKPFSQDRRVFVVKNG
EDVEVNINIEIKKKDRHLLKLS

FIG. 34

VITLELHPSEIARYFELEECSHYFSNLLLRKRGELQEFEPIIRRKEIETIE
LAKWGDEFELSLLQEFKKGEALKKLGVKELPRFYGFLTENDTPVRKFFEKY
FKDGIIVEEDPDKLLEIINSEKSAVIYQAPLKGRIGKFDVSGRADFIIKVG
KTLYLLEAKFTKEEKFYHRIQAIIYAHLLSQMIEGYEIKLAVVTKENFPIP
SNFLRFPGDVEELKITLEEKLGGILREQELWIDARCTTCPFEALCLSKALE
ERSLGLLSLPPGIIRILKEEGIKDLKDMAKLFEFKENSPTNFEEPSIKDPK
KTQEIAKRTGINLLKLSRIAQAILKYLDEGETTPLFIPRTGYNLPMDERVG
DVEPSYYPPRSLVKVFFYVQTSPITDTIIGISALVKNRQNGERIIVKFVDE
PPIEVSDAQEKERMLLIEFFRDVIDAVKSLSPTDKVYLHMYFYNRKQRDDL
MDAVKRHKEIRENNAVMALLSLRRAIDWESFSIIKDEIIRRHALPLSPGLG
FVTVATQFGYRWRRNKTFARMLEVVARRENGKINLKTLLNISETGIGPEYY
PIIDRDNEGIPFTLFWSALVKLATEEDNSRIKRDIRDILSQMVEALKTIEE
RIPEQYKDAFVKKEGIPKEDLENFDIKKEELADILLEYLQLEFDARFRERS
EYYRLPLSIRAYSEESALIKIENIEKKKNDCLLFGKIVLIDENGRIKEYNP
KEVLIDIDEGSLVVVTPKKFLDKLRRDPVQRISKSPLGIVEAIDHETGKVV
IRLIRVSPGRFTLKHSKFSCKNGLLTITYPEGEVKVTPGEIVIVDPSVDDI
GMERAYNVLSEISQGELKHEIYQKVKAIYEGNTESRYEVNIWKKKHIEEFL
SRVKKINEEQKKFAIDINNFLVTLQGPPGTGKTSGAIAPAILARAYSMVKD
KKNGLFVVTGVSHRAVNEALIKTLKLKKELENTLKELRKIDLIRAVSGEEA
IKIIKEELEREIKDDVDRIRFTAQEITHSSKQRSLDKYFANSGTVRIVFGT
PQTLNKLMKNTKEVELVVIDEASMMDLPMFFLSTKVCKGQVLLVGDHRQME
PIQVHEWQLEDRKTFEEHYPFLSALNFIRFLRGELDERELKKFKRILGREP
PEWKKDKNEVLPLYRLVRTYRLPQEIADLLSDAIYRADGIKLISEKKKRRK
IIARHKDEFLSIVLDDRYPFVLILHDEGNSTKINELEAKIVEKIIKRVENI
DIGVVVPYRAQKRLIASLIDSAQVDTVERFQGGEKSLIVISMTSSDPRIPG
KGF

FIG. 35

MNIKSFINRLKELVEIEREAEIEAMRLEMKRLSGVERERLGRAILSLNGKI
VGEELGYFLVKYGRNKEIKTEISVGDLVVISKRDPLKSDLLGTVVEKGKRF
IVVALEPVPEWALRDVRIDLYANDITFKRWIENLDRVRKAGKKALEFYLGL
DEPSQGEEVSFEPFDKSLNPSQRKAIAKALGSEDFFLIHGPFGTGKTRTLV
ELIRQEVKRGNKVLATAESNVAVDNLVERLAKDGVKIVRVGHPSRVSRHLH
ETTLAYLITQHELYGELRELRVIGQSLAEKRDTYTKPTPKFRRGLSDAEII
KLAEKGRGARGLSARLIKEMAEWIKLNRQVQKAFEDARKLEERIARDIIRE
ADVVLTTNSSAALDVVDATDYDVAIIDEATQATIPSILIPLNKVDRFILAG
DHKQLPPTILSLEAQELSHTLFEGLIEKYPWKSEMLTIQYRMNERIMEFPS
REFYDGRIVADESVKNITLADLGIKVNASGIWRDILDPNNVLVFIDTCMLE
NRFERQRRGSESRENPLEAKIVSKIVEKLLESGVKAEMMGVITPYDDQRDL
ISLNVPEEVEVKTVDGYQGREKEVIILSFVRSNKAGEIGFLKDLRRLNVSL
TRAKRKLIMIGDSSTLSSHETYRRLIEHVREKGLYVVLTKDSI

ATPase ASSAY FROM PHAGE INDUCED HELICASES

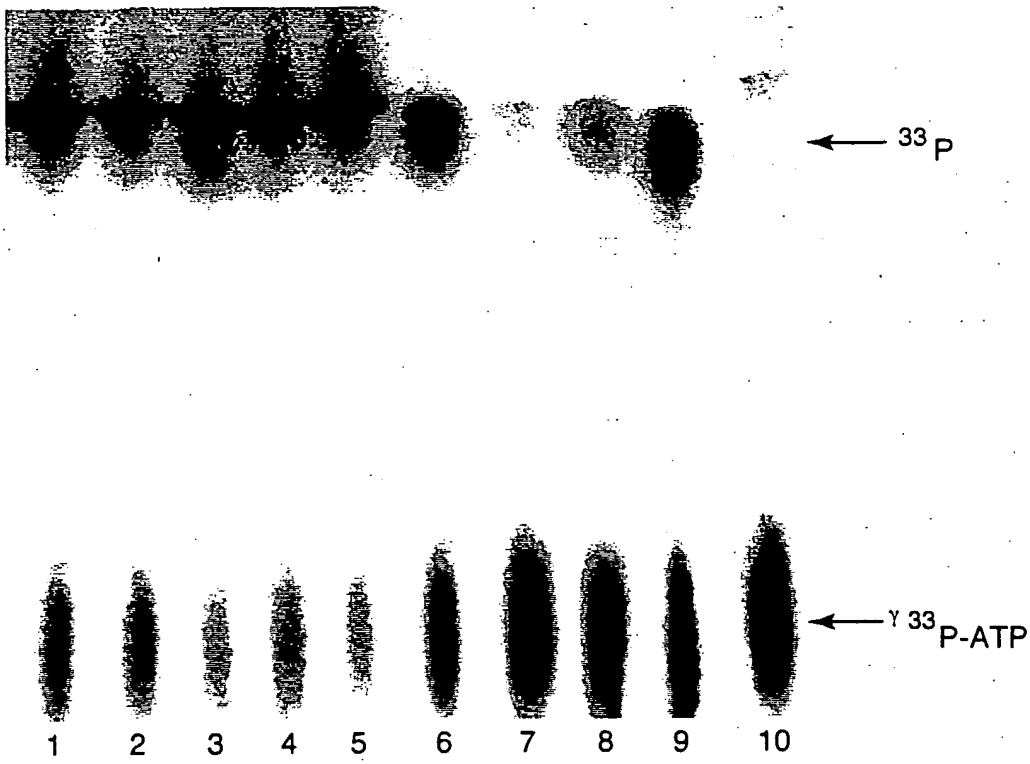


FIG. 36

ATPase ASSAY FROM IPTG INDUCED HELICASES

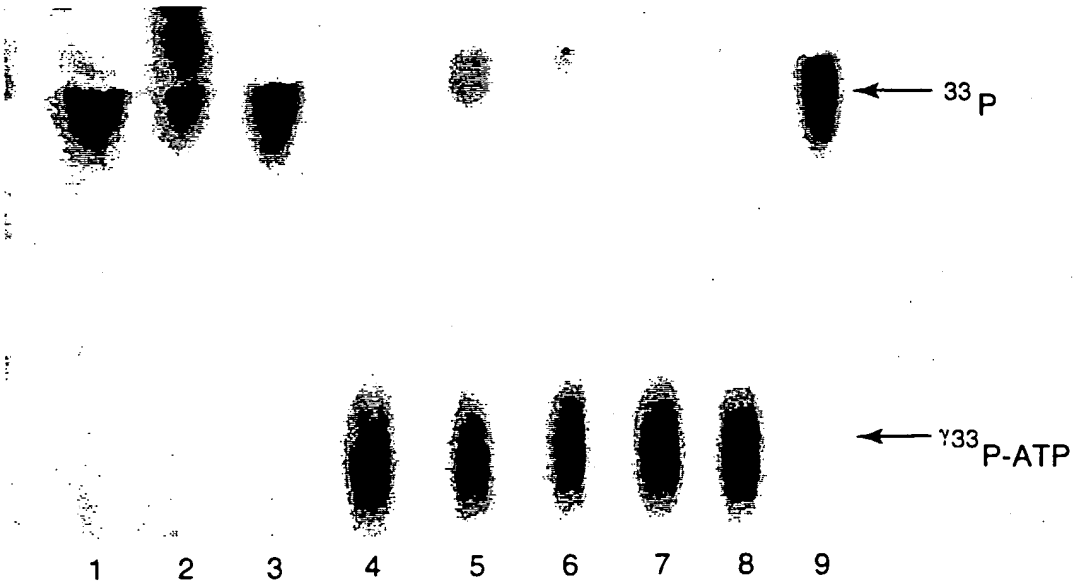


FIG. 37

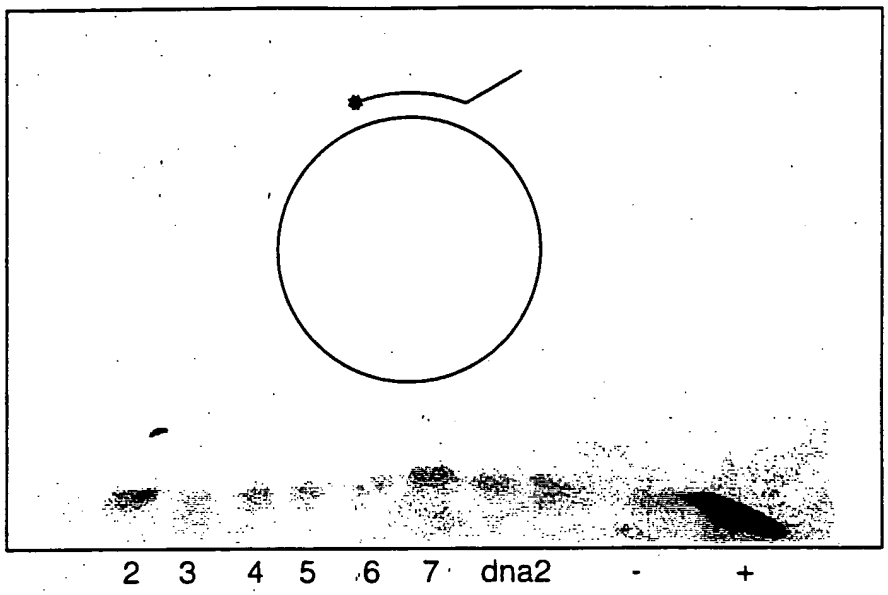


FIG. 38A

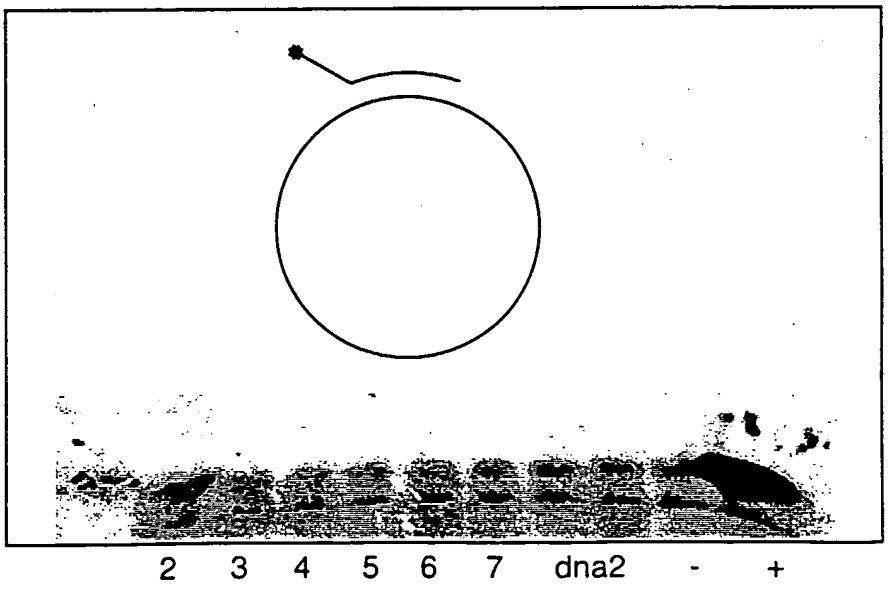


FIG. 38B

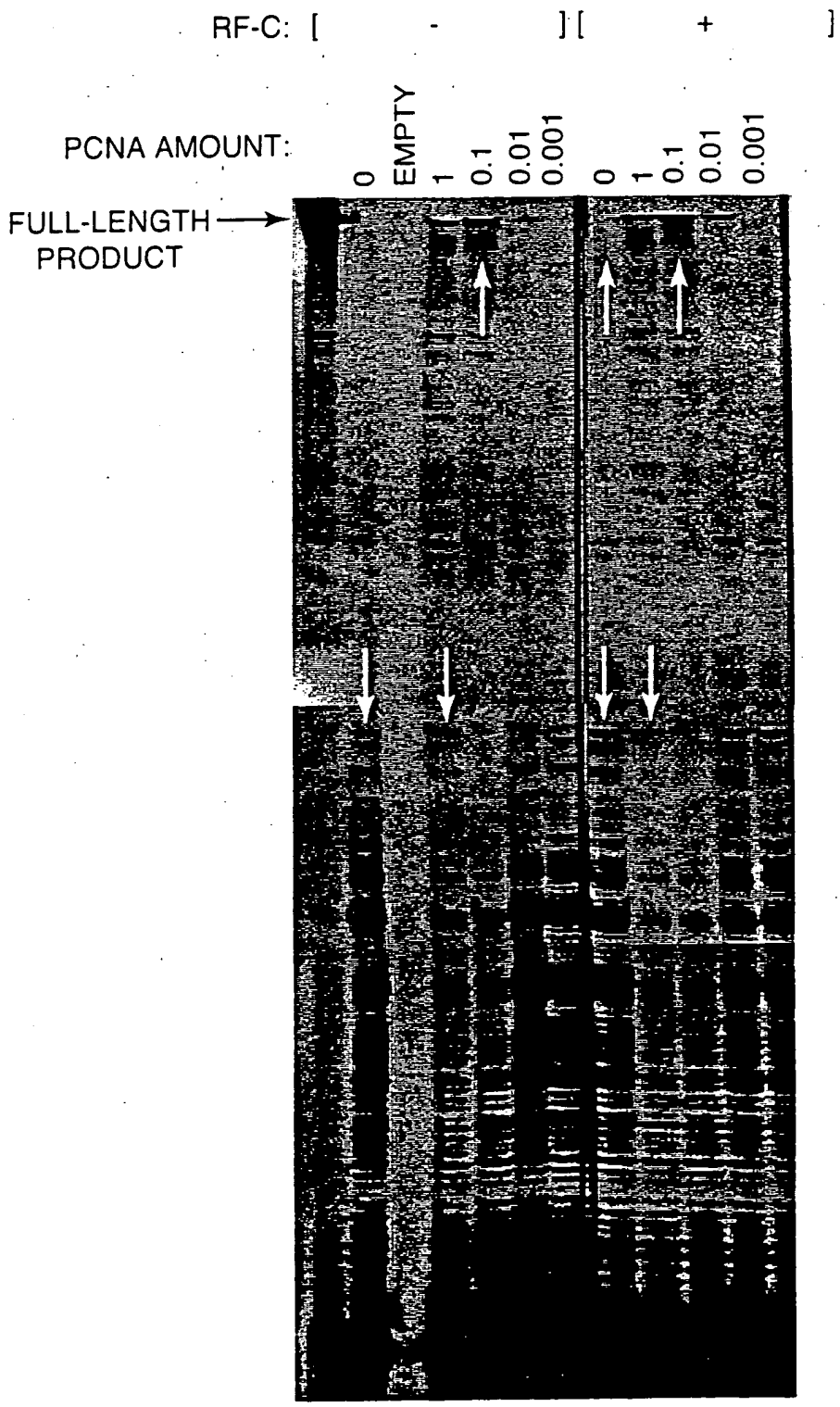

RF-C: [-][+]
PCNA AMOUNT:
0
EMPTY
1
0.1
0.01
0.001
0
1
0.1
0.01
0.001
FULL-LENGTH PRODUCT

FIG. 39

FIG. 40

ATGAGGGTTGATGAGCTGAGAGTTGATGAGAGGATAAAGAGTACTTTGAAG
GAGAGAGGTATCGAATCCTTTTACCCTCCCCAAGCCGAGGCCTTAAAGAGC
GGGATATTGGAAGGTAAGAATGCATTAATTTCAATTCCAACGGCCAGCGGA
AAAACACTAATTGCTGAGATTGCCATGGTTCATAGGATTTTGACCCAGGGA
GGAAAGGCTGTATACATAGTCCCGCTGAAGGCCTTGGCTGAAGAAAAGTTT
CAGGAGTTCCAGGATTGGGAGAAGATTGGGTTAAGAGTAGCGATGGCCACT
GGGGATTACGACTCAAAGGATGAGTGGTTGGGGAAATACGACATAATCATT
GCGACGGCTGAGAAGTTTGATTCCCTTTTAAGGCATGGCTCAAGTTGGATT
AAGGATGTGAAGATTTTAGTTGCTGACGAGATTCATTTGATTGGTTCAAGA
GACAGAGGAGCTACGCTTGAAGTTATCCTAGCTCATATGCTCGGAAAGGCC
CAAATAATTGGACTCTCTGCAACGATAGGAAATCCAGAGGAGCTTGCGGAG
TGGTTAAATGCCGAGCTAATAGTCAGTGACTGGAGGCCCGTTAAGCTTAGA
AGGGGAGTTTTTTACCAAGGCTTTGTTACCTGGGAAGATGGAAGTATAGAC
AGGTTTTCCTCCTGGGAAGAGTTAGTTTACGATGCAATTAGGAAGAAGAAA
GGAGCGCTAATTTTTGTAAACATGAGAAGGAAGGCTGAGAGAGTAGCTTTG
GAGCTTTCTAAAAAAGTTAAGTCTCTCCTCACGAAACCTGAGATTAGAGCT
TTAAATGAATTGGCTGATTCCCTCGAGGAAAATCCCACAAATGAAAAGCTA
GCTAAGGCCATTAGGGGTGGAGTTGCGTTCCACCACGCTGGTCTTGGGAGA
GATGAGAGGGTTCTCGTGGAGGAGAACTTTAGAAAGGGTATAATAAAGGCC
GTAGTTGCCACCCCAACACTTTCGGCGGGAATTAACACTCCAGCGTTTAGG
GTGATTATAAGGGATATTTGGAGGTACTCTGACTTTGGAATGGAGAGAATT
CCGATAATCGAGGTTCACCAAATGCTTGGGAGAGCTGGAAGGCCGAAGTAT
GATGAGGTTGGGGAGGGAATAATAGTTTCTACAAGCGATGATCCGAGAGAG
GTAATGAATCACTACATATTTGGAAAGCCTGAAAAACTGTTCTCCCAGCTC
TCCAACGAGAGTAATTTGAGAAGTCAAGTTTTGGCCCTAATAGCGACCTTT
GGCTATTCAACTGTGGAGGAGATTTTGAAGTTCATCTCAAACACATTCTAT
GCTTATCAAAGGAAGGACACATACTCTTTAGAGGAGAAGATAAGGAACATA
CTCTACTTCCTCCTAGAGAATGAGTTCATAGAGATATCCTTAGAGGATAAA
ATAAGGCCGCTTTCCCTGGGAATTAGGACTGCAAAGCTTTATATCGATCCC
TATACGGCCAAGATGTTCAAGGATAAAATGGAGGAAGTTGTTAAAGATCCA
AATCCTATAGGAATATTTCACTTAATCTCCCTAACTCCGGATATAACCCCC
TTCAACTACTCAAAGAGAGAATTTGAAAGGCTCGAAGAGGAATACTACGAA
TTCAAGGATAGGTTATACTTTGACGATCCCTACATTTCGGGTTACGACCCC
TACCTAGAGAGGAAGTTCTTCAGAGCTTTCAAAACTGCACTAGTGCTTCTG
GCATGGATAAATGAAGTCCCTGAGGGAGAAATAGTTGAAAAGTACTCGGTG
GAACCTGGGGACATCTATAGGATAGTTGAGACGGCTGAGTGGCTGGTGTAC
TCTCTAAAGGAAATTGCAAAAGTTCTTGGAGCTTATGAGATCGTTGATTAT
CTTGAAACATTGAGGGTTAGGGTCAAGTATGGGATTAGGGAGGAATTGATT
CCCCTAATGCAACTCCCGTTGGTTGGAAGAAGGAGAGCTAGAGCTCTTTAC
AATAGCGGATTTAGAAGTATAGAGGATATATCTCAAGCGAGGCCAGAAGAG
CTTTTGAAAATCGAGGGGATAGGGGTCAAGACCGTTGAGGCTATCTTCAAG
TTTCTTGGTAAGAATGTGAAAATTTCGGAGAAACCTAGAAAAAGTACCCTT
GATTACTTTCTCAAATCTTGA

FIG. 41

MRVDELRVDERIKSTLKERGIESFYPPQAEALKSGILEGKNALISIPTASG
KTLIAEIAMVHRILTQGGKAVYIVPLKALAEEKFQEFQDWEKIGLRVAMAT
GDYDSKDEWLGKYDIIIATAEKFDSLLRHGSSWIKDVKILVADEIHLIGSR
DRGATLEVILAHMLGKAQIIGLSATIGNPEELAEWLNAELIVSDWRPVKLR
RGVFYQGFVTWEDGSIDRFSSWEELVYDAIRKKKGALIFVNMRRKAERVAL
ELSKKVKSLLTKPEIRALNELADSLEENPTNEKLAKAIRGGVAFHHAGLGR
DERVLVEENFRKGIIKAVVATPTLSAGINTPAFRVIIRDIWRYSDFGMERI
PIIEVHQMLGRAGRPKYDEVGEGIIVSTSDDPREVMNHYIFGKPEKLFSQL
SNESNLRSQVLALIATFGYSTVEEILKFISNTFYAYQRKDTYSLEEKIRNI
LYFLLENEFIEISLEDKIRPLSLGIRTAKLYIDPYTAKMFKDKMEEVVKDP
NPIGIFHLISLTPDITPFNYSKREFERLEEEYYEFKDRLYFDDPYISGYDP
YLERKFFRAFKTALVLLAWINEVPEGEIVEKYSVEPGDIYRIVETAEWLVY
SLKEIAKVLGAYEIVDYLETLRVRVKYGIREELIPLMQLPLVGRRRARALY
NSGFRSIEDISQARPEELLKIEGIGVKTVEAIFKFLGKNVKISEKPRKSTL
DYFLKS

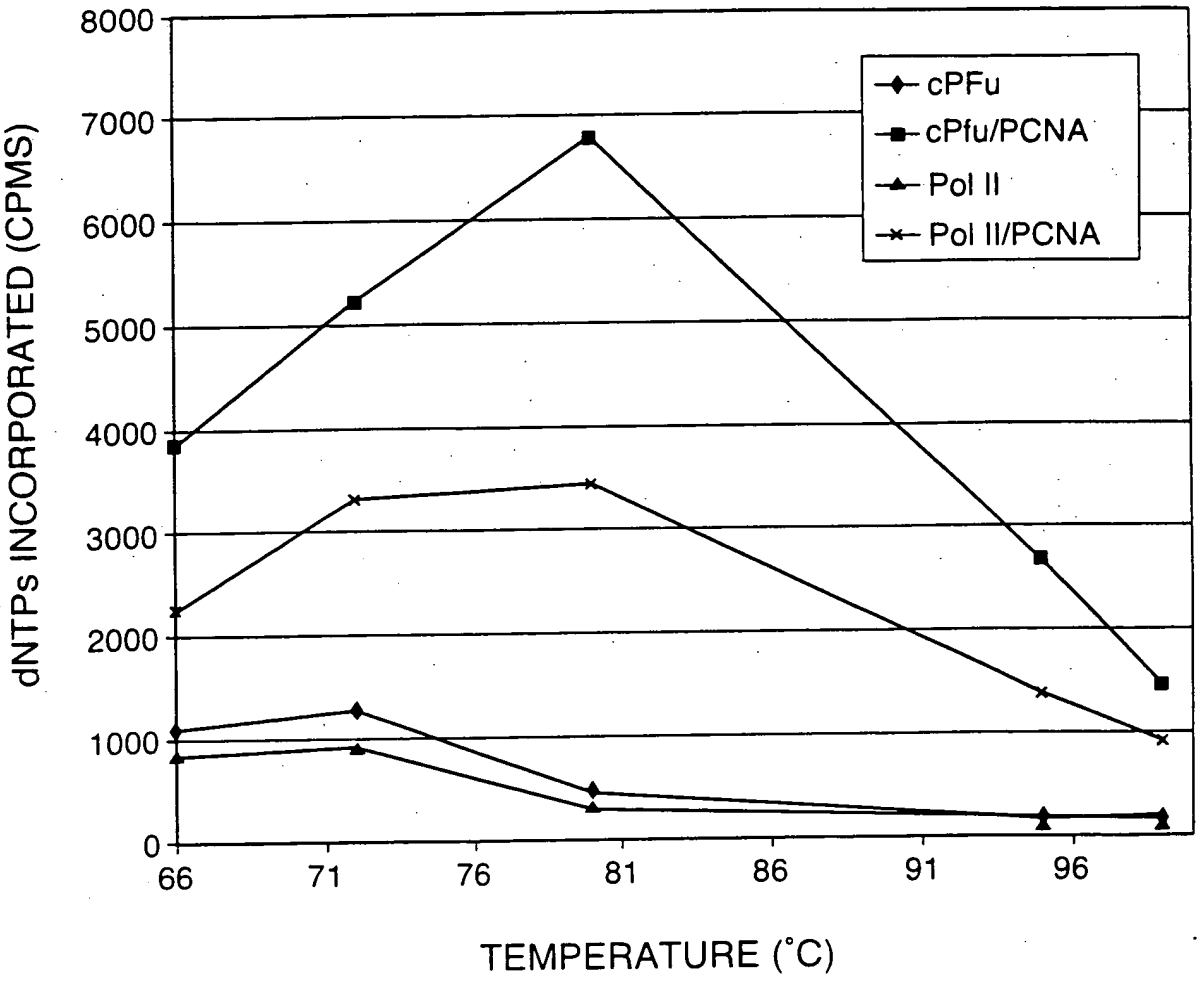

8000
7000
6000
5000
4000
3000
2000
1000
0
dNTPs INCORPORATED (CPMS)
66
71
76
81
86
91
96
TEMPERATURE (°C)
cPFu
cPfu/PCNA
Pol II
Pol II/PCNA

FIG. 42